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FORECASTED SUPPLY AND DEMAND FOR COMESTIBLE FISH IN ISRAEL – 2001-2005

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Abstract

Between 1994 and 1998, the total inland (freshwater) aquaculture production in Israel rose 6.5% from 15,681 to 16,700 tons. This positive trend, however, reversed in 1999, as a consequence of an outburst of a new viral disease that killed 1500 tons of common carp and large quantities of ornamental cyprinids. During the same period (1994-9), marine aquaculture production grew 688% from 350 to 2408 tons. In the future, this trend may be inhibited by environmental regulations. Because of the expected demographic growth, the local demand for edible fish will grow 16.5% from 64,910 tons in 1999 to 75,600 tons by 2005. To meet this demand, the combined supply from imports and local production will have to grow at 2.58% per year. Anything short of that will boost prices and possibly deter consumers from buying fish. In spite of industry efforts, production of local fisheries and aquaculture has not exceeded 6000 and 19,000 tons, respectively. Fish imports average 63.7% of the national consumption. Most of the imports originate in marine fisheries. According to the FAO, supply from global fisheries is expected to lag behind global demand, causing prices to rise. Long-term efforts by Israeli farmers and the government to adopt aquafarms have enabled inland aquaculture to cope with increasing restrictions on water use for agriculture and maintain a slight growth in production during the last decade. If financially backed by the government, aquafarms are expected to develop intensive closed water culture systems that will eventually enhance production in spite of the scarcity of water.

Introduction

In recent years, Israel has been undergoing a period of economic changes, including urbanization, a water shortage and restrictive environmental legislation, that strongly affect the agricultural sector as well as other economic sectors. Under such conditions, any prognosis of future supply and demand in an industry such as fisheries and aquaculture can be somewhat precarious. Nevertheless, the Department of Fisheries and Aquaculture believes that such a prognosis, based on the best available information, is necessary to help

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determine reasonable policies. This forecast is based on statistical data concerning all sources of supply of fish to the Israeli market and factors that influence the future sources of supply and demand.

Sources of Supply

Local sources of supply of fish in Israel are freshwater (inland) and marine aquaculture and marine and lake fisheries (Table 1, Fig. 1). Between 1994 and 1998, freshwater aquacul-

Table 1. Local fish production in Israel, in tons (Snovsky and Shapiro, 1999).

	1994	*1995*	*1996*	*1997*	*1998*	*1999*
Marine fisheries	2,785	3,727	3,384	3,761	4,135	3,739
Lake fisheries	1,478	1,214	1,845	1,475	1,445	2,144
Total fisheries	4,263	4,941	5,229	5,236	5,580	5,883
Freshwater aquaculture	15,681	16,342	16,854	16,671	16,700	16,368
Marine aquaculture	350	650	963	1,593	1,850	2,408
Total aquaculture	16,031	16,992	17,817	18,264	18,550	18,776
Total local production	20,294	21,933	23,046	23,500	24,130	24,659

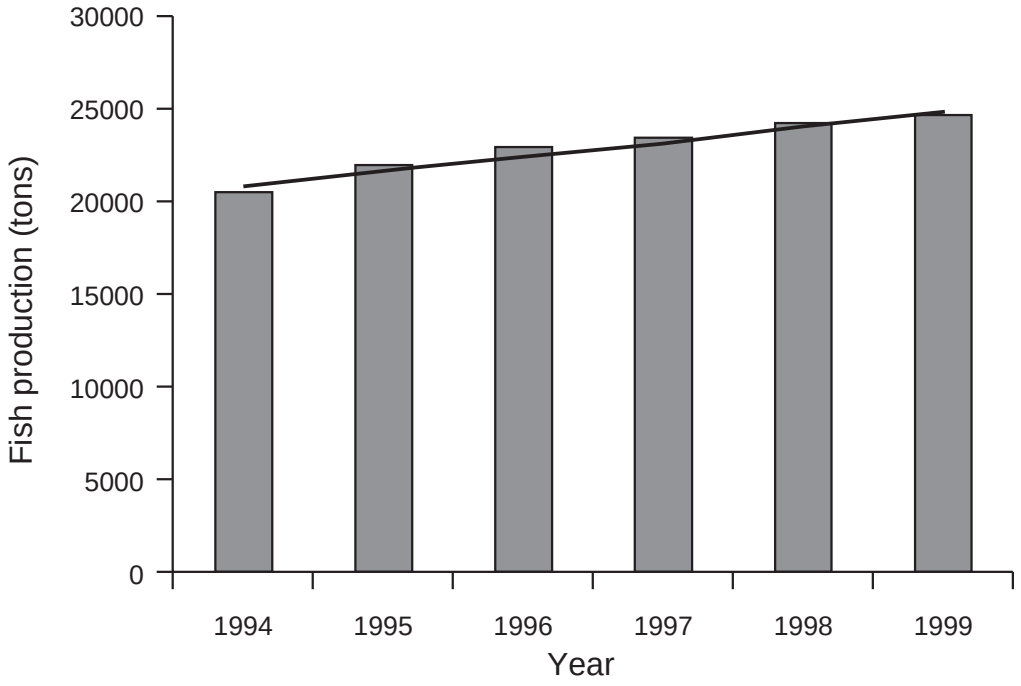

Fig. 1. Total local fish production in Israel, 1994-1999.

ture grew from 15,681 to 16,700 tons (6.5%). This represents a yearly growth of 1.3%. In 1999 a new virus, probably koi herpes virus (KHV), infected carp stocks and caused severe mortality estimated at 1500 tons (personal information). From 1994 to 1999, marine aquaculture grew by an impressive 688% or 50% per year. Compared to the 1980s, during which a negative trend prevailed, production from lake and marine fisheries grew slightly, as a consequence of a number of administrative steps taken by the Department of Fisheries and Aquaculture. Fish consumption by source and the ratio supplied by imports are presented in Table 2. Imports from 1991 to 1999 are presented in Fig. 2. The trend clearly demonstrates the fact that, during those years, importers were very conservative and seem to have made no serious efforts to expand their businesses.

Imports. Future supplies of fish to Israel will continue to rely heavily on imports, mostly from marine sources. According to the FAO (1998), 44% of comestible fish species in the global catch are already exploited at their maximal level, 16% are being overfished to a point that endangers their sustainability and only 33% are still within the permissible level of exploitation. Consequently, in global terms, the supply of fish from marine sources is expected to decline. The effect of this negative trend is even more accentuated by the fact that the global demand for fish is continually growing in parallel with the growth of the world population. In view of these trends, it can be expected that international agencies as well as fishing countries will eventually enhance their efforts to regulate fishing, impose quotas or ban fishing of certain species altogether. In such a case, supply to Israel, which depends heavily on these fisheries, will be affected. As an example, the stagnant trend of catches from the Atlantic Ocean, a major source of supply to Israel, is presented in Fig. 3.

Local marine fisheries. Following the alarming decline in production from local Mediterranean fisheries, the Department of Fisheries and Aquaculture decided in 1994 to stop any further enhancement of the fishing fleet. This was followed by a ban imposed on trawl fisheries in 1998. These measures were aimed at reducing the overall fishing pressure,

Table 2. Fish consumption in Israel (in thousands of tons), the ratio supplied by imports and its fluctuation from the average, 1991-1999.

	1991	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*Avg.*
Imports	33.00	39.00	42.00	36.77	44.72	37.60	36.23	35.00	40.25	38.29
Local production	21.01	18.42	18.87	20.29	21.93	23.05	23.50	24.13	24.66	
Total consumption	54.01	57.42	60.87	57.06	66.65	60.65	59.73	59.13	64.91	
Import/total consumption	61%	68%	69%	64%	67%	62%	61%	59%	62%	63.70
Fluctuation from the average	-2.7%	+4.3%	+5.3%	+0.3%	+3.3%	-1.7%	-2.7%	-4.7%	-1.7%	

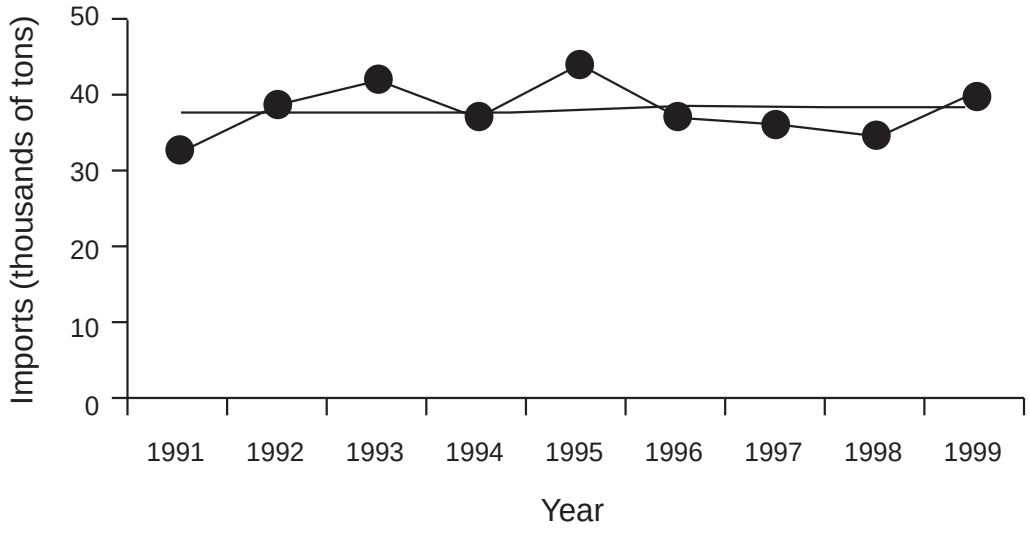

Fig. 2. Fish imports, 1991-1999.

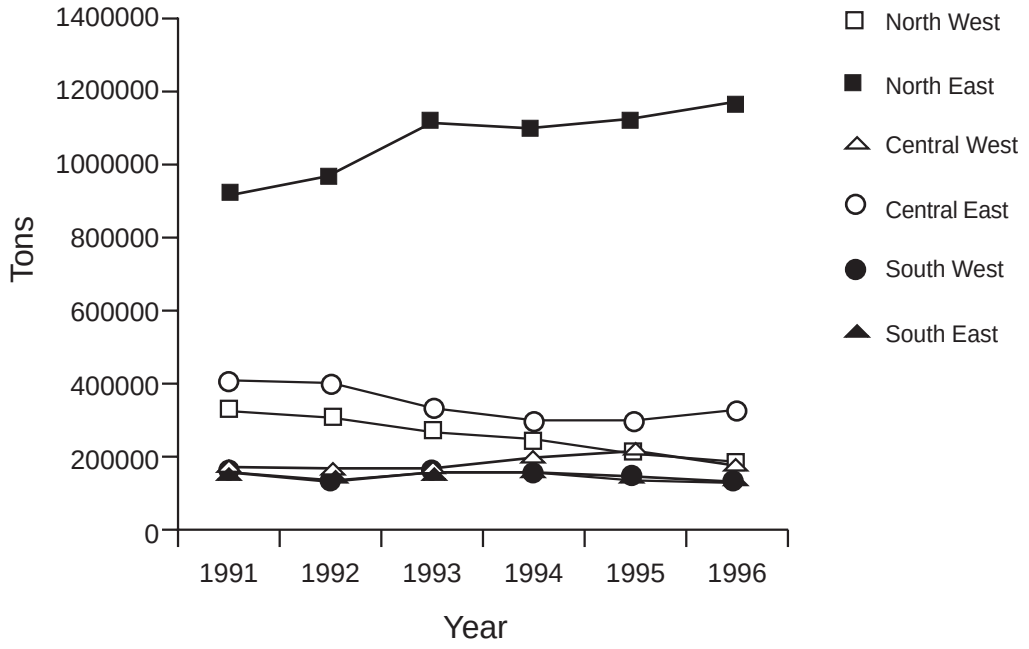

Fig. 3. The Atlantic Ocean fisheries, by zone (FAO, 1996).

as well as the catch of undersized fish. Preliminary results show that positive results have already been obtained (Fig. 4).

Local lake fisheries. After Lake Kinneret (Sea of Galilee) fisheries reached their lowest point in 1990 (980 tons), they now seem to be recovering and produced 2144 tons (Fig. 5) in 1999 (Snovsky and Shapiro, 2000). This achievement seems to be the result of administrative steps taken by the Department of Fisheries that banned all fishing activities in tilapia spawning areas during May and June.

Inland aquaculture. Several years of drought and overexploitation of water resources have resulted in severe restrictions on water use. The Fisheries Department nevertheless believes that freshwater aquaculture will be less affected by these measures than land crops since, for the last twenty years, the aquaculture sector has been preparing itself for such an eventuality (Mires, 1995). Conventional fishponds were transformed into dual-purpose water reservoirs that depend on rain runoff or brackish water unfit for agriculture, and farms have adopted regimes by which very little or no water at all is released.

– *The upper Galilee.* Because all effluents from the upper Galilee eventually enter Lake Kinneret, Israel's main water reservoir, water accumulated in compounds north of the lake, including fishponds, are considered part of the national reservoir. On the one hand, there are no plans to dry these reservoirs within the next five years; aquaculture is basically a byproduct in them and will not be liable to serious limitations on water use. Hence, aquaculture in the upper Galilee is expected to maintain its current level. On the other hand, a policy aimed at

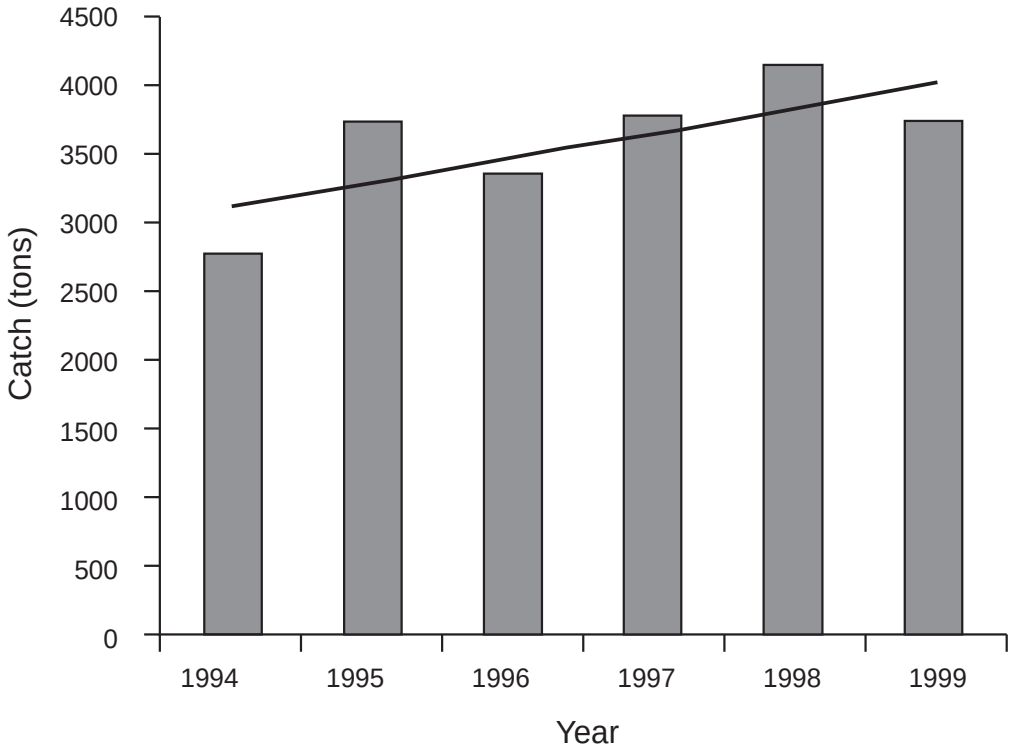

Fig. 4. Catches from the Mediterranean Sea, 1994-1999.

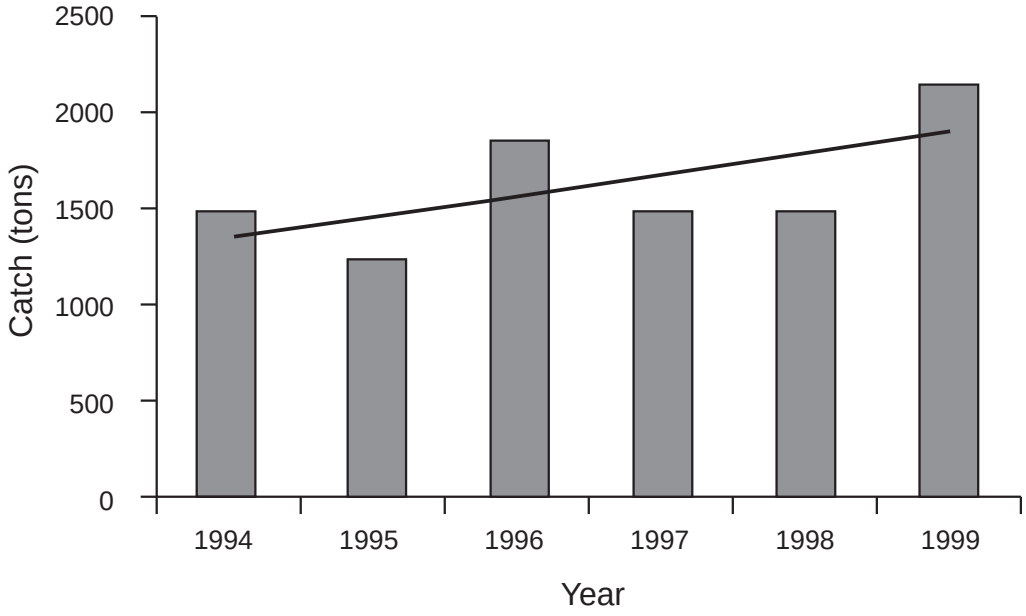

Fig. 5. Catches in Lake Kinneret (Sea of Galilee), 1994-1999.

drastically reducing (by 80%) water use in all agricultural sectors is being discussed at various ministerial levels. If implemented, aquaculture is bound to suffer a serious setback.

– *The eastern valleys of Beit Shean and Jezreel.* These regions are the main producers of inland fisheries. They exploit water sources of different qualities for aquaculture, some fresh and some brackish. For many years, the Water Authority has been using reservoirs in this region for both irrigation and aquaculture by mixing water from the two sources to a level suitable for both activities. Precise regulation of the water salinity maximizes the quantity of water available for the whole agricultural sector. In addition, most farms have planned the water outlets of their farms in a way that water effluents from one pond are pumped to another. In some cases, farms at lower elevations utilize effluents from higher farms. So far, there are no national plans for desalinating brackish water and desalination will probably not be implemented within the time limit of this forecast.

– *The coastal region.* Fish farms in this region are located in two areas: Haifa Bay and south of Haifa. Winter runoff, brackish ground water and river water (all very dependent on rainfall) are the main sources for the fishponds. So far, most farms have managed to operate successfully in spite of occasional droughts. Production in this region will suffer only as a result of very severe consecutive droughts.

– *The Negev desert and the Arava valley.* Aquafarms in the desert regions are dependent on local aquifers that are excluded from the list of water sources upon which national restrictions are imposed. Most are deep saline aquifers, unsuitable to the requirements of land crops. Since pond effluents cannot possibly pollute water sources in or beyond this region, farms can culture exotic species that are forbidden in other regions. In the long run, these can develop into exclusive and profitable cash crops.

Marine aquaculture. Marine aquaculture production in Israel has grown dramatically from a mere 80 tons in 1992 to 2408 tons in 1999, mostly produced in two cage farms in the northern part of the Bay of Eilat. Lately, this industry has been severely opposed by environmentalists who claim that wastes from the cages affect the coral

reefs. As a consequence, in 1998, the Minister of the Environment imposed a quota on feed which will limit production to its current level, unless a lower food conversion ratio can be obtained. In spite of efforts, mariculture aquaculture beside the Mediterranean coast has been unable to overcome the severe constraints which limited its development. It is not expected to expand significantly within the limits of this forecast. If, during the next five years, R&D budgets will be obtained, the industry will develop inland mariculture in the northern part of the Bay of Eilat and along the Mediterranean coast, but it will take some time before production is substantially affected.

Expected Demand

The three main factors affecting demand for comestible fish are: (a) per capita demand, (b) global and local demographic changes and (c) political events and their effects on per capita income. Following the immigration of numerous Russian Jews to Israel during the 1990s, per capita consumption dropped. Earlier, during the 1980s, it had peaked at 12.6 kg. This can be explained by the poorer financial capabilities of the new population which did not allow them to purchase a relatively high priced product like farmed fish. Now that the situation of the newcomers is improving, per capita consumption is gradually rising again and is expected to reach 11.6 kg by 2005 (Table 3; Fig. 6).

Forecasted Supply

Because of uncertainties concerning the attitude of importers and government policies for fisheries and agriculture, this forecast is presented in two alternatives. The pessimistic alternative assumes a 1.5% yearly increase in local production and the optimistic alternative assumes a 3.0% annual increase (Table 4). The additional

Table 3. Annual per capita fish consumption (kg) in Israel in 1990-1999 (Snovsky and Shapiro, 1999), 2000 and 2005 (estimated by the Ministry of Agriculture, Department of Fisheries).

Year	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2005*
kg/capita	12.26	10.68	11.18	11.03	10.39	11.86	10.83	10.10	9.91	10.46	10.7	11.6

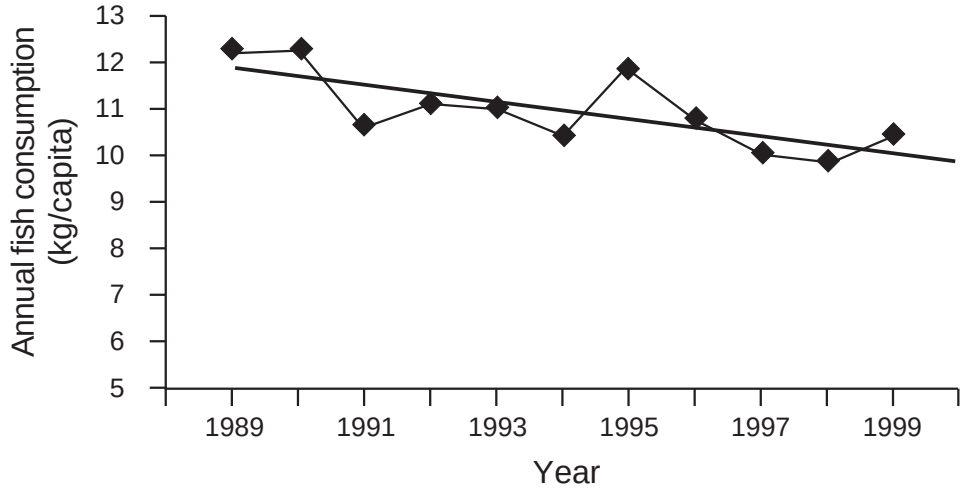

Fig. 6. Annual per capita fish consumption (kg) in Israel, 1989-1999 (Snovsky and Shapiro, 1999).

imports required to meet the expected demand for each of the alternatives is also shown.

The table shows that unless imports increase 21-26% from the current level of 38,290 tons to 46,000-48,000 tons, demand will surpass supply by 2005. To meet the expected demand, imports will have to grow from 62% in 1999 to, perhaps, 64%. If imports fail to grow, as has been the recent case (Table 2), (a) how will national expenditures on fish imports be affected, (b) how will consumers react to changes in the ratio between supply and demand and (c) to what extent can aquaculture depend on a stable interaction between demand for fish and demand for other products?

Israel's relatively small amount of imports can have no serious impact on the global demand for fish, therefore, global fisheries will not be affected by an increase of imports. However, national expenditure on imports will rise as a result of the expected rise in the prices of imported fish. Wholesale prices rose 13% from $2.438/kg in 1996 to $2.756 in 1997. Such a rise would increase national expenditure on 40,000 tons of fish by $12.7 million. If, during the next five years, importers change their attitude and increase imports from some 40,000 to 50,000 tons and prices rise to $3/kg, national expenditure will increase from $110 million in 1997 to $150 million in 2005. Any rise, of course, would depend on the fluctuations of demand for fish and for other protein sources.

Fish and fish products compete with other animal foods. The competition largely depends on the relative prices of the two. It can be argued that higher prices for fish will cause consumers to choose other animal products such as chicken or meat. This could be true, but only to a limited extent, since (a) competition has always existed and yet the fluctuations of demand between fish and other protein sources have been marginal. (b) Consumers are usually not affected by the average price of products but, rather, on the price of the specific product they want. Within the fish market there is, and always will be, a large range of prices. Customers will always have a choice between high-priced items and low-priced items, and will not have to abandon the fish stalls altogether. (c) An enhanced demand for fish is expected as

Table 4. Forecasted fish supply and demand in Israel (in thousands of tons), 1999-2005.

Year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
Forecasted demand	64.91*	66.59	68.30	70.07	71.87	73.73	75.63
Local production (avg yearly increase 1.5%)	24.66*	25.03	25.41	25.79	26.17	26.57	26.96
Required imports to meet demand (tons)	40.25*	41.56	42.89	44.28	45.70	47.16	48.67
Required imports to meet demand (% of demand)	62*	62.4	62.8	63.2	63.6	64.0	64.4
Local production (avg yearly increase 3.0%)		25.4	26.16	26.95	27.76	28.59	29.45
Required imports to meet demand (tons)		41.19	42.14	43.12	44.11	45.14	46.18
Required imports to meet demand (% of demand)		61.9	61.7	61.5	61.4	61.2	61.0

*Actual figures for 1999.

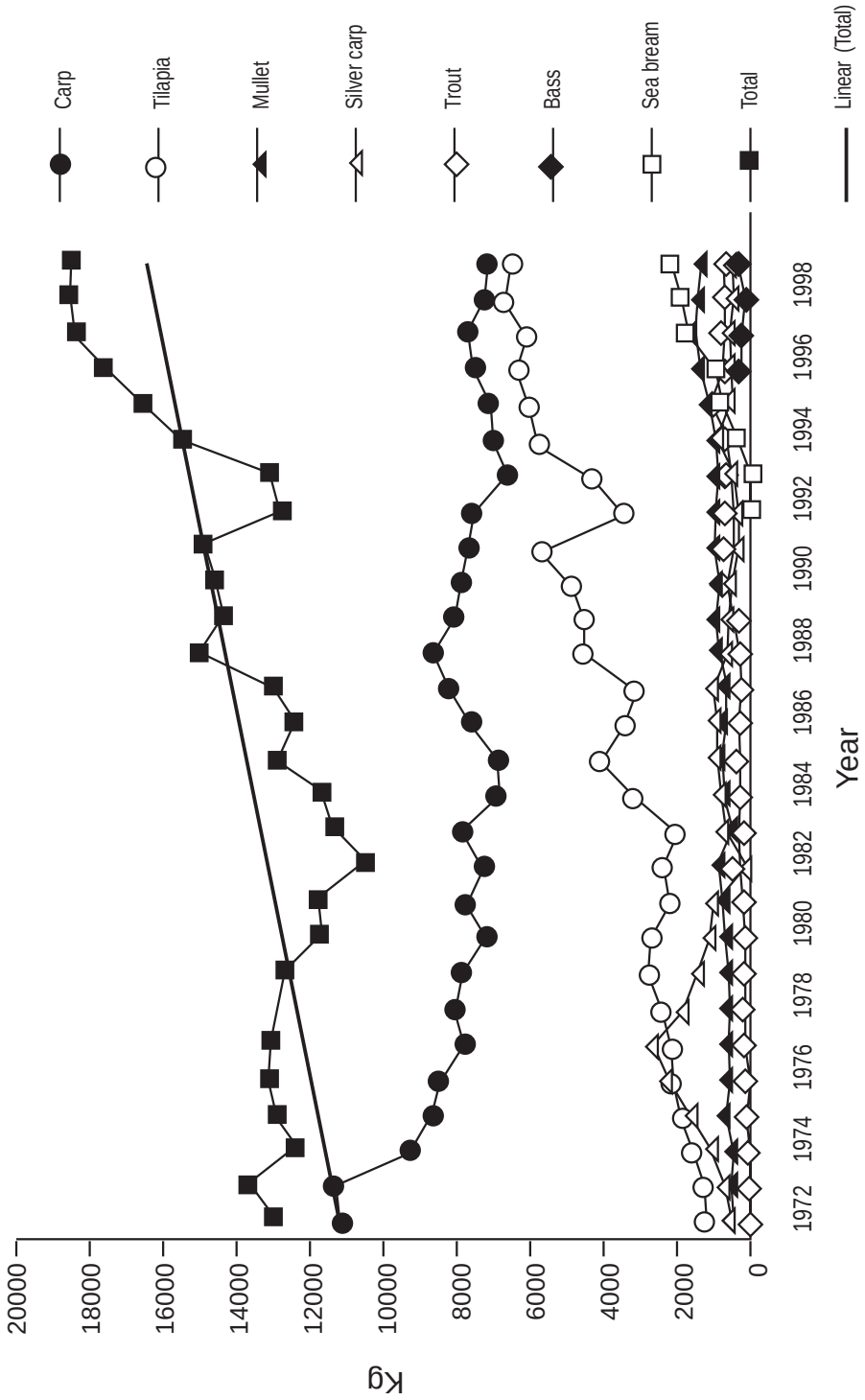

Fig. 7. Aquaculture production in Israel.

a consequence of the expected demographic growth, but there is no reason to believe that the public's consumption habits will change. The demand for fish is expected to grow proportionately to the growth of the population.

Demand for different kinds of locally produced fish varies. Some believe that consumption patterns are strongly related to ethnic traditions and that, if prices surpass a certain level, customers will continue to buy the preferred fish, albeit in lower quantities, rather than choose another species. Based on experience, however, this belief is unfounded. Fig. 7 demonstrates the shift of preferences, especially from carp to tilapia, even though the process may require a long period of adaptation.

Discussion

Based on the above, the supply and demand ratio in Israel will change in favor of demand. In spite of recent improved management and restrictive fishing regulations, outputs from marine and lake fisheries will remain around 5000 tons. Development of inland aquaculture will depend on governmental policies concerning water consumption and R&D aimed at producing more fish with less water. For marine aquaculture to grow beyond its current level, environmental restrictions imposed on this sector must be alleviated to a degree acceptable for both mariculture and the environment. Concurrently, financial support for the development of alternative, environmentally friendly methods of production capable of replacing traditional cage culture systems must be made available. In the absence of such funding, the total aquaculture production will be able to increase at an annual rate of 2% or less, reaching some 20,000 tons by 2005.

Imports are not expected to grow beyond their current percentage of the total consumption and, because of the expected demographic growth, will remain around 45,000 tons. In the present state, the expected supply from all sources in 2005 will remain around 70,000 tons while demand will grow to 75,000 tons. The rationale behind the demand for R&D budgets aimed at enhancing aquaculture production is that, in its humble way, aquaculture contributes to the reduction of imports and national expenditures in foreign currency.

The supply and demand of a product such as fish is governed by a host of factors that interact within ever-changing business environments that include both local production and imports. Imports, in turn, depend on the potential of global fisheries to overcome the ever-growing fishing pressure on stocks. Because of the relatively high fluctuation in demand, consumers tend to shift from one product to another according to availability, price and other factors. Thus, when the market price of one species rises as a consequence of decreasing supply, chances are that customers' preferences will shift to a cheaper product. This, in its turn, enhances demand for the cheaper product which is quickly followed by a rise in price. An example of this phenomenon occurred in Israel when, beginning in the early 1970s, the decreasing demand for carp was replaced by a higher demand for tilapia. With time, this was accompanied by a radical change in the public perception of tilapia. Once thought of as a trash fish, tilapia turned into a very respectable item that now proudly appears on the menus of all restaurants. Such a process can trigger an increase in the average prices of fish, benefiting both local producers and importers. But, on the other hand, consumers may shift their preferences from fish to other protein sources, reducing the demand for fish and stabilizing prices at current levels. Producers, as well as importers, are therefore urged to reduce production and trade costs, make their businesses more productive and efficient so as to balance the ratio between supply and demand and stabilize prices at a level where customers will not shift from fish to other products.

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