Country report: Turkey

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SUMMARY – This paper reports the Turkish fisheries production, trade and consumption patterns within the format developed by the MASMANAP Concerted Action. Between 1988-1997 the contribution of capture fisheries to the overall domestic supply of aquatic products was 96.5% (average). However, an upward trend is observed in the share of aquaculture products rising from 1% in 1988 to 10% in 1997. As regards foreign trade, both imports and exports have been increasing since 1991. Imports of aquatic products in terms of landed weight increased from 24,201 t in 1991 to 43,544 t in 1997. During the same period exports increased from 15,386 t to 46,992 t. Annual per capita fish consumption is low in Turkey (around 7.5 kg in 1997), below the world average of 13 kg. Availability of fisheries products and dietary traditions appear to be the main factors limiting the consumption of fish.

Key words: Turkey, fishery, aquaculture, seafood, supply, consumption.

RESUME – *"Rapport national : Turquie". Cet article présente la production de la pêche en Turquie, ainsi que les tendances du commerce et de la consommation en suivant la méthodologie mise au point par le programme Action Concertée MASMANAP. Entre 1988-1997 la part de la pêche de capture dans l'offre intérieure globale de produits aquatiques a été de 96,5% (en moyenne). Cependant on observe une tendance à la hausse pour la proportion des produits aquacoles qui est passée de 1% en 1988 à 10% en 1997. En ce qui concerne le commerce extérieur, les importations ainsi que les exportations ont augmenté depuis 1991. Les importations de produits aquatiques en termes de poids débarqué se sont accrues, passant de 24 201 t en 1991 à 43 544 t en 1997. Pendant la même période, les exportations ont augmenté de 15 386 t à 46 992 t. La consommation annuelle de poisson par habitant est faible en Turquie (environ 7,5 kg en 1997), inférieure à la moyenne mondiale de 13 kg. La disponibilité des produits de la pêche et les traditions alimentaires semblent être les principaux éléments qui limitent la consommation de poisson.*

Mots-clés : *Turquie, pêche, aquaculture, produits de la mer, offre, consommation.*

Introduction

Turkey is situated in the Eastern Mediterranean region, 3% of its territory is in Europe and 97% in Asia. Its mainland coastlines comprise: 1695 km on the Black Sea, 2805 km on the Aegean and 1677 km on the Mediterranean Sea.

In the recent years, the Turkish economy attained a good developing trend, with the GNP achieving an average increase of 5.3% per annum between 1980-1990, 3.2% between 1990-1995 and average of 7.8% between 1995-1997. Gross national product reached 204.6 billion US$ in 1998 with subsequent GNP per capita being 3255 US$. The share of agriculture (including fisheries) in the GDP was around 30% at the end of 1960's, but declined to around 15% in 1990's. In 1998 agriculture (including fisheries), industry and services comprised 18%, 20% and 62% of the GDP respectively. The growth rate of fisheries sector was –0.8% in 1997 and 5.6% in 1998 (Anonymous, 1999; Anonymous, 2000a; Anonymous, 2000b). The share of fisheries sector (including aquaculture) in GNP however, still remains to be rather low, being around 0.5%.

Population of Turkey was 62,865,000 in 1997. Roughly 65% live in urban centres and the rest in rural areas. 9.4 million tourists visited Turkey in 1998, with the tourism revenues being 7.2 billion US$.

Turkish fisheries production reached a peak level of 676,000 t in 1988 (including aquaculture) (Anonymous, 1989) mainly due to increase in anchovy (*Engraulis encrasicolus*) landings which constitutes the main fishing item of Black Sea and Turkish fisheries industry as a whole. This was

followed by a sharp decline in overall capture fisheries production between 1989-1992 due to lack of appropriate management and over-exploitation of anchovy stocks. An apparent recover has been observed since 1993, with the production stabilizing around 500,000 t in the recent years. In 1998 total Turkish fisheries production was 543,900 t, of which 487,200 t came from capture fisheries and 56,700 t from aquaculture (Şenel *et al.,* 2000). As far as aquaculture is concerned, a rapid growth was observed between 1988-1998, with the production increasing from 4100 t (1988) to 56,700 t (1998). The share of aquaculture in overall supply of aquatic products has subsequently increased form 1.0% (1988) to 10.0% (1998).

The following report is prepared within the framework of Concerted Action Fair-CT98-3500 titled "Methodology for seafood market studies in the aim of introducing new aquaculture products". The aim of the report is to present an overview of Turkish seafood production, trade and consumption.

Methodology

The aim of this report is to evaluate Turkish fisheries production, trade and consumption patterns within the format developed and proposed by CA and to characterize Turkish seafood market. Below the sources used in the preparation of the report and the consequent constraints are cited.

Production statistics

Production figures given in this report are based on yearly fisheries statistics published by State Institute of Statistics (SIS), the most recent one being issue in 1998 covering 1997 fisheries statistics. Available data covering 1988-1997 have been rearranged and computed according to format proposed by CA. Anchovy landings processed for fish meal and oil production have not been included in total supply figures. Whenever accessible, 1998 figures were also included.

Data on fisheries production were compiled by the Ministry of Commerce until 1967 based on records of provincial fish markets. Ever since data on fisheries production are collected and published by SIS. Data are collected through questionnaire forms with cooperation of Ministry of Agriculture and Rural Affairs (MARA) as far as the marine catches are concerned. Data on freshwater fisheries production are provided directly by MARA to State Statistics Institute. Since collection of data is based on surveys using questionnaire forms undeclared catches can be the case resulting in under-estimation of catches and creating uncertainty as far as reliability of data is concerned.

Price data

Estimation of monetary value of production were based on price time series published by State Institute of Statistics (SIS) and State Planning Organization (SPO). The main constraint is that prices published by SIS and SPO seem to be retail prices. This handicap results in over-estimation of value of production. SIS has been publishing average retail prices of marine fish species starting from 1991. Nevertheless, comprehensive time series on average prices of marine, freshwater and farmed species are only available from 1996 and on. Therefore, it has only been possible to compute the average monetary value of production for years 1996 and 1997. Consequently, estimation of monetary value of consumption is also limited to years 1996 and 1997. Due to lack of sufficient price time series it has not been possible to outline the trends in price of either marine or other species.

Foreign trade data

Data presented on foreign trade are based on import and export statistics published by SIS and Undersecretariat of Foreign Trade. The following shortcomings associated with lack of sufficient and consistent data and deficiency of nomenclature have limited the scope of the section on foreign trade:

(i) SIS, fisheries foreign trade statistics (both volume and value) are only available from 1992 onwards.

(ii) Statistical figures published by these two institutions are not consistent due to the fact that data published by SIS do not include canned products, and canned pelagic fish (mainly tuna) constitute a big portion of Turkish seafood exports both in terms of volume and value.

(iii) Crustaceans and Molluscs are categorized as "shellfish" in import and export statistics published by Undersecretariat of Foreign Trade. Moreover; canned crustaceans, molluscs and cephalopods, are presented as aggregated single item. As far as fresh and frozen products are concerned it has been possible to differentiate the items (crustaceans and molluscs) according to species groups since they are also included in SIS statistics. However; this has not been the case for canned crustaceans, molluscs and cephalopods since canned products are not included in SIS statistics. Therefore; canned crustaceans, molluscs and cephalopods import and export figures have not been included in foreign trade and consumption assessments. Canned fish import and export figures have been regarded as pelagic canned fish since both import and export canned fish are either tuna or anchovy.

(iv) It has not been possible to compute 1997 consumption of non-pelagic fish and shellfish on species bases due to abundance of item "other chilled fish" and "other frozen molluscs" in export statistics.

(v) Though sea snail (top shell) is one of Turkey's export items, due to deficiency in nomenclature, it has been difficult to identify this item in import and export statistics. It seems that the term "other molluscs" refers to this item.

(vi) Lack of consistency in import and export position codes, has made it occasionally impossible to identify species.

Seafood consumption and marketing channels

Research on Turkish aquatic food (seafood) market has been neglected both by academic institution and the industry. Therefore it is very difficult to get access to specific data on consumption patterns of seafood, retail outlets, catering services and marketing channels. The only comprehensive survey was carried out by Ministry of Agriculture and Rural Affairs (conducted by Macalister Elliott and Partners Ltd) with the support of World Bank and published in 1996 (cited as Anonymous, 1996a). Data presented in this report on characteristics of consumption and distribution channels, household expenditure on seafood, consumer preferences and marketing channels are based on findings of above mentioned survey.

Total supply of fisheries and aquaculture products

Turkish supply of aquatic products is largely dependent on capture fisheries (and mainly marine capture fisheries). Between 1988-1997 contribution of capture fisheries to overall domestic supply of aquatic products was 96.5% (average). However, a downward trend is observed in share of capture fisheries due to increase in volume of aquaculture products. The share of capture fisheries has decreased from 99.0% in 1988 to 90.0% in 1997, while the share of aquaculture has increased from 1.0% to 10.0% during the same period. The trends in volume of capture fisheries and aquaculture production are illustrated in Fig. 1. Due to lack of sufficient price time series it has not been possible to compute the trends in the value of production. Nevertheless, values of production for 1996 and 1997 are outlined in Table 1. Over-estimations are the case as mentioned earlier, since the values are estimated based on retail prices.

In 1998 total supply of aquatic products was 543,900 t of which 487,200 t (90.0%) came from capture fisheries and 56,700 t (10.0%) from aquaculture (Fig. 2).

Capture fisheries

Turkish fisheries production is characterized by predominance of marine catches and namely, anchovy catches, which on average comprised 49% of the marine fisheries landings between 1988-1997. Total fisheries production reached a peak level of 671,900 t (including anchovy catches processed for fish meal and oil) in 1988, followed by a sharp decline between 1989-1992. Since 1993 total fisheries production has been stabilized around 500,000-600,000 t. Since 1988 the amount of anchovy processed by fish meal and oil industries have been showing a downward trend, dropping from 162,000 t in 1988 to 21,000 t in 1997. This trend has been the result of high domestic demand for anchovy and the size composition of the catch.

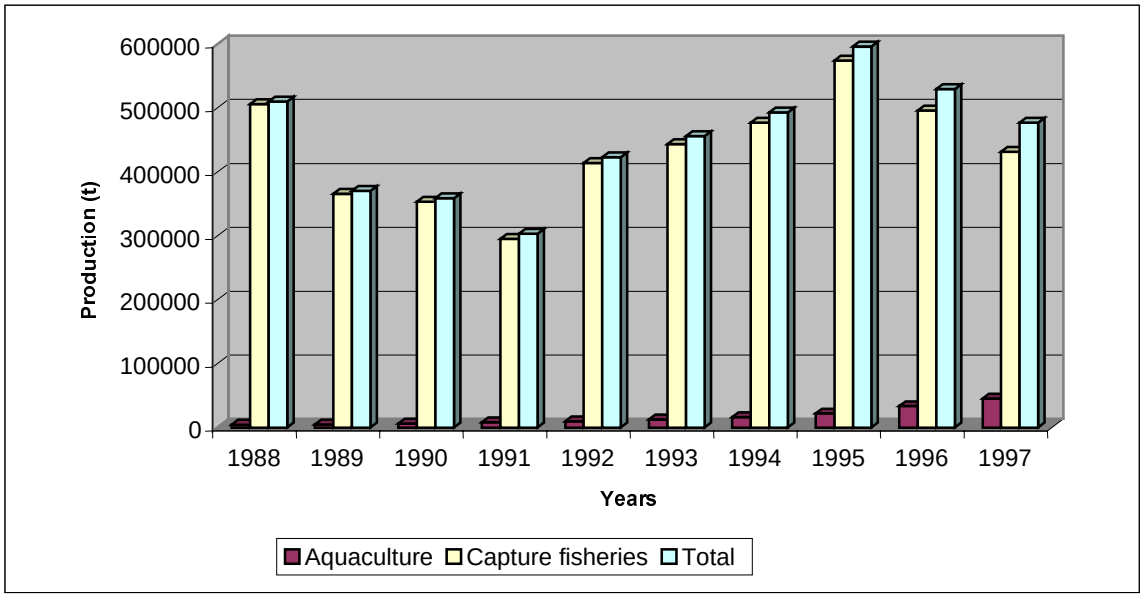

Fig. 1. Total supply of aquatic products for human consumption in Turkey between 1988-1997 (based on data from SIS, Fisheries Statistics, various years).

Table 1. Values of capture fisheries and aquaculture production in 1996 and 1997, 1000 US$ (based on data from Anonymous, 1997; 1998a)

Year	Total	Salmonids	Other fish	Shellfish	Crustaceans	Cephalopoda	Others
1996	1,241,680	72,463	1,094,385	44,959	23,775	5,709	389
1997	1,076,728	95,685	924,204	32,298	17,459	6,662	420

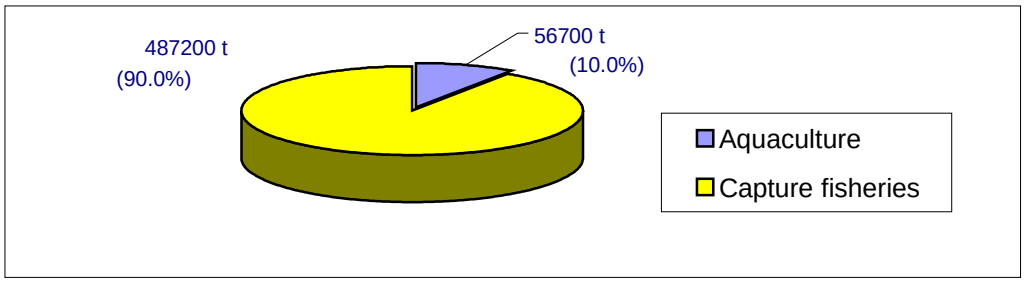

Fig. 2. Capture fisheries and aquaculture production of Turkey in 1998 (based on data from Şenel *et al.,* 2000).

As far as supply for human consumption is concerned the peak in production was observed in 1995, with supply reaching 574,378 t (Fig. 3).

Species groups

Pelagic fish species, and mainly anchovy *(Engraulis encrasicolus*), horse mackerel (*Tracharus tracharus*), scad (*Trachurus mediterraneus*) and pilchard (*Sardine pilchardus*), mullet (*Mugil cephalus*), bonito *(Sarda sarda*) and bluefish (*Pomatomus saltator*) comprised 56-78% of Turkish fish landings during 1988-1997, with the average being 67.0% (Fig. 4). Nevertheless; the biggest share belongs to anchovy which constitutes the backbone of the capture fisheries in Turkey.

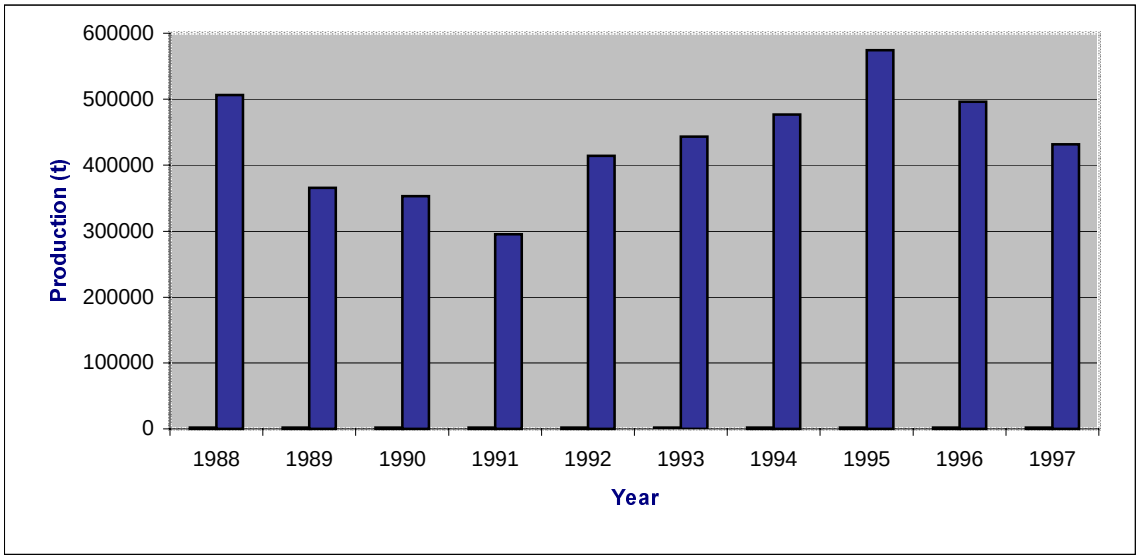

Fig. 3. Volume of capture fisheries landings between 1988-1997 (based on data from SIS, Fisheries Statistics, various years).

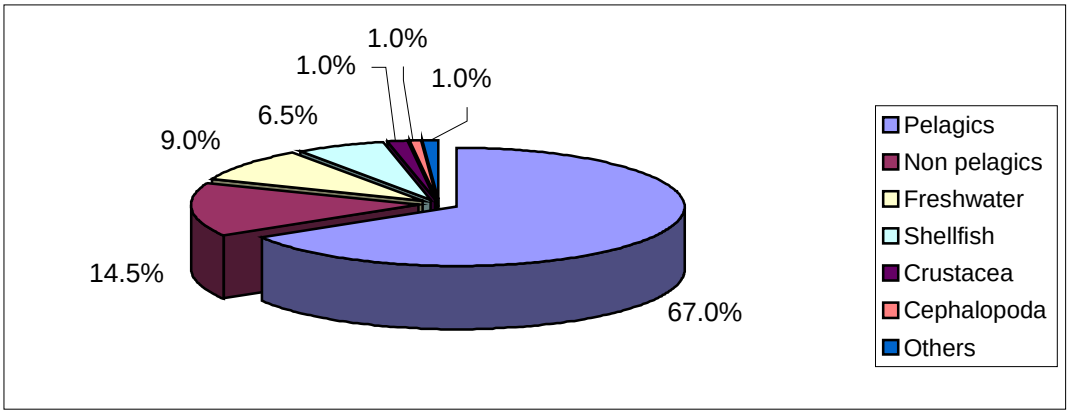

Fig. 4. Composition of Turkish fisheries landings between 1988-1997 by category of species (based on data from SIS, Fisheries Statistics, various years).

Non pelagic fish species on average comprised 14.5% (Fig. 4) of the catches during the same period and the main species being, whiting *(Merlangius euxinus*), striped mullet (*Mullus barbatus*) and striped red *(Mullus surmuletus*).

During 1988-1997 freshwater fish species constituted 9.0% (Fig. 4) of the Turkish capture fisheries production. Mullet (*Chalcarbusnus tarichi)* (this species is a Cyprinid fish harvested mainly from Lake of Van) and common carp (*Cyprius carpio*) were the main species harvested.

The average shares of other species group namely, shellfish, crustaceans and cephalopods were computed as 6.5%, 1.0% and 1.0% respectively (Fig. 4).

Crayfish (*Astacus leptodactylus*) and shrimp are the main Crustacean species harvested and exported because of low domestic demand. Crayfish landings declined starting from 1989 due to a fungal diseases. An apparent recovery in crayfish stocks is observed since 1997.

Cockle *(Chamelea gallina*), Mediterranean mussel *(Mytilus galloprovincialis*) and sea snail are the dominant species as far as shellfish production is concerned. Cockle and sea snail are export item with no significant domestic consumption.

Long finned squid (*Loligo* spp.) and cuttlefish *(Sepia* spp.) are the dominant species as far as cephalopods landings are concerned.

Anchovy, whiting, horse mackerel, mullet, bonito, striped mullet, striped red and turbot are the most important items harvested by Black Sea fisheries. Though turbot landings have decreased due to over-fishing in the recent years. Pilchard, mullet, hake, chup mackerel, striped and red mullet are dominant species in landings of Aegean fisheries. Anchovy, horse mackerel and mullet constitute the most important fisheries item for the Sea of Marmara. As far as Mediterranean fisheries are concerned pilchard, mullet, striped mullet and sea bass constitute the high portion of the landings.

Cockle is generally harvested in Western Black Sea the Sea of Marmara. Mussel and sea snail fisheries enjoy high yields in Black Sea. Shrimp is an important item for Marmara, Aegean and Mediterranean fisheries. Octopus, squid and cuttlefish are harvested in Aegean and Mediterranean waters.

Trends in volume of landings

Trends in volume of fisheries production in Turkey is highly susceptible to landings of pelagic fish species and mainly anchovy , since these species are the dominant items landed. During 1988-1997 supply of pelagic species for human consumption fluctuated between 173,242 and 450,184, while the supplies of non-pelagic and freshwater fish species were more stagnant (Fig. 5).

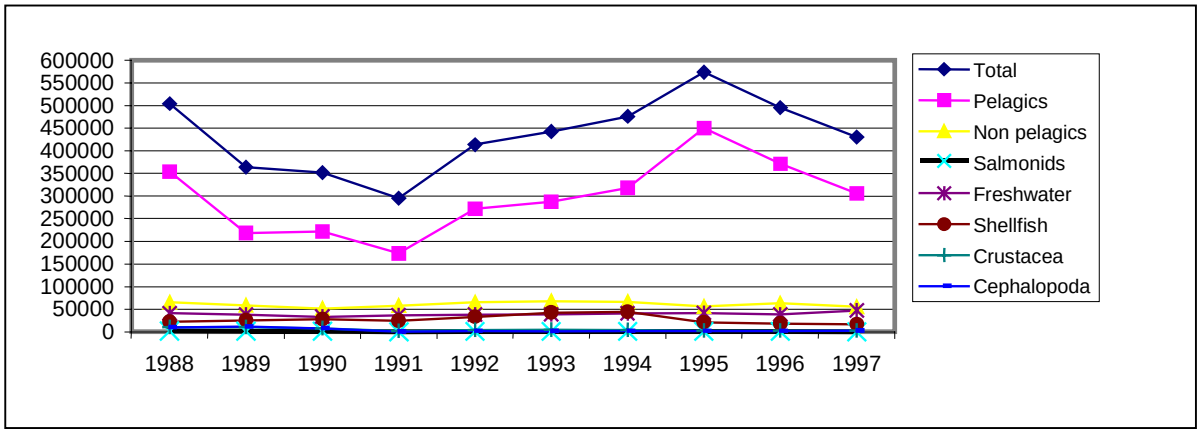

Fig. 5. Volume of Turkish capture fisheries landing between 1988-1997 by group of species (based on data from SIS, Fisheries Statistics, various years).

Trends in values of landings and prices

As mentioned earlier estimation of value of production was based on retail prices published by SIS. This has led to over-estimation of value of production. Based on data available for 1996 and 1997, the monetary values of production and average retail prices for different species groups are given in Table 2.

1997 production figures

Volume of capture fisheries landings for human consumption amounted to 431,648 t in 1997, with pelagic, non pelagic and freshwater fish species comprising 71%, 13% and 11% of the supply respectively. Shellfish, crustaceans, cephalopods, others and salmonids constituted the remaining 5% in decreasing order (Fig. 6).

Table 2. Values of capture fisheries landings and average prices by species groups for 1996 and 1997 (based on data from Anonymous, 1997; 1998a)

	1996		1997	
	Value (1000 US$)	Average price (US$/kg)	Value (1000 US$)	Average price (US$/kg)
Total catches	1,061,561		866,543	
Pelagic fish	680,515	3.2	505,706	3.0
Non-pelagic fish	234,806	4.5	197,198	4.5
Salmonids	1,975	5.0	1320	6.6
Freshwater fish	85,177	2.7	111,280	2.7
Shellfish	39,205	2.5	27,698	1.7
Crustaceans	13,785	7.7	16,259	6.3
Cephalopoda	5709	3.5	6662	3.2
Others	389	3.4	420	1.7

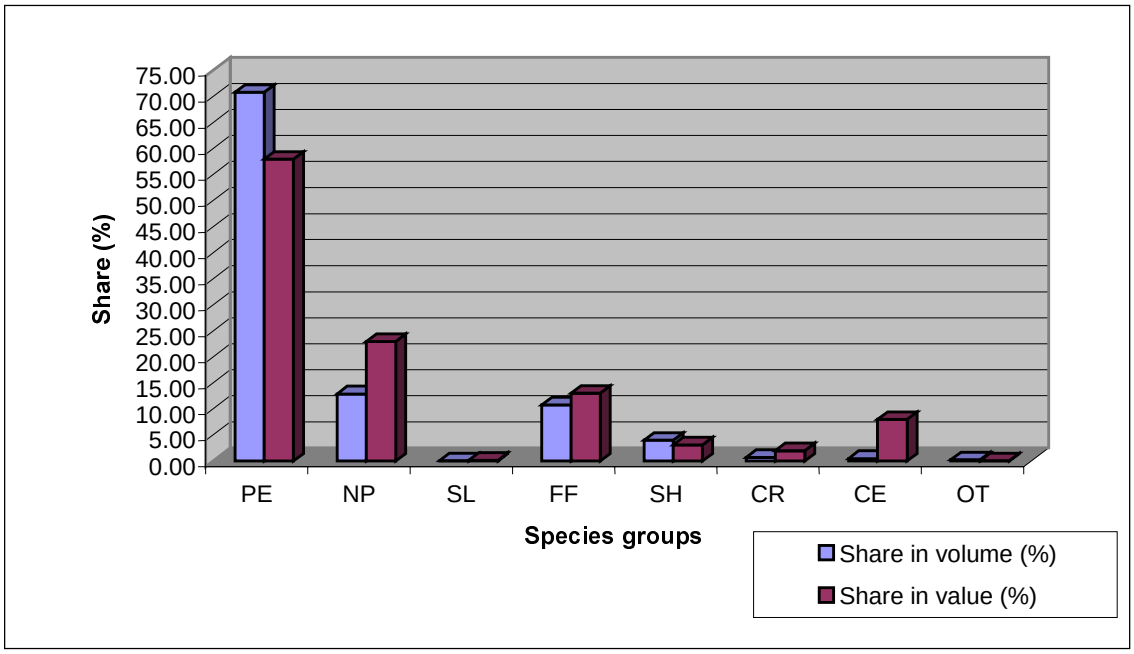

Fig. 6. Breakdown of Turkish supply of capture fisheries in 1997 in terms of volume and value (share in %) (based on data from Anonymous, 1998a). PE: pelagics, NP: non-pelagics, SL: salmonids, FF: freshwater, SH: shellfish, CR: crustaceans, CE: cephalopods, OT: others.

The value of production for human consumption was estimated as 866.5 million US$ in 1997. The contributions of pelagic, non-pelagic and freshwater fish species to this sum were computed as 58%, 23% and 13% respectively. The remaining 6% belonging to shellfish, crustaceans, cephalopods, salmonids and others (Fig. 6).

The volume and value of pelagic fish landings were 305,550 t and 505,706,000 US$ respectively in 1997. Anchovy, mullet, pilchard, chup mackerel, horse mackerel, bonito, scad and bluefish comprised 97% of the capture fisheries landings in volume in 1997. The share of these species in value of landings was computed as 95% in 1997 (Fig. 7).

The volume and value of non-pelagic fish landings were 55,515 t and 197,198,000 US$ respectively in 1997. Whiting, hake, red mullet, striped red, common sole, sea bass, tope shark, sea

bream, picarel, two banded bream, painted comber and turbot counted for 90% of the non-pelagic fish landings in volume in 1997. Their share in terms of value of landings was estimated as 87.5% (Fig. 8).

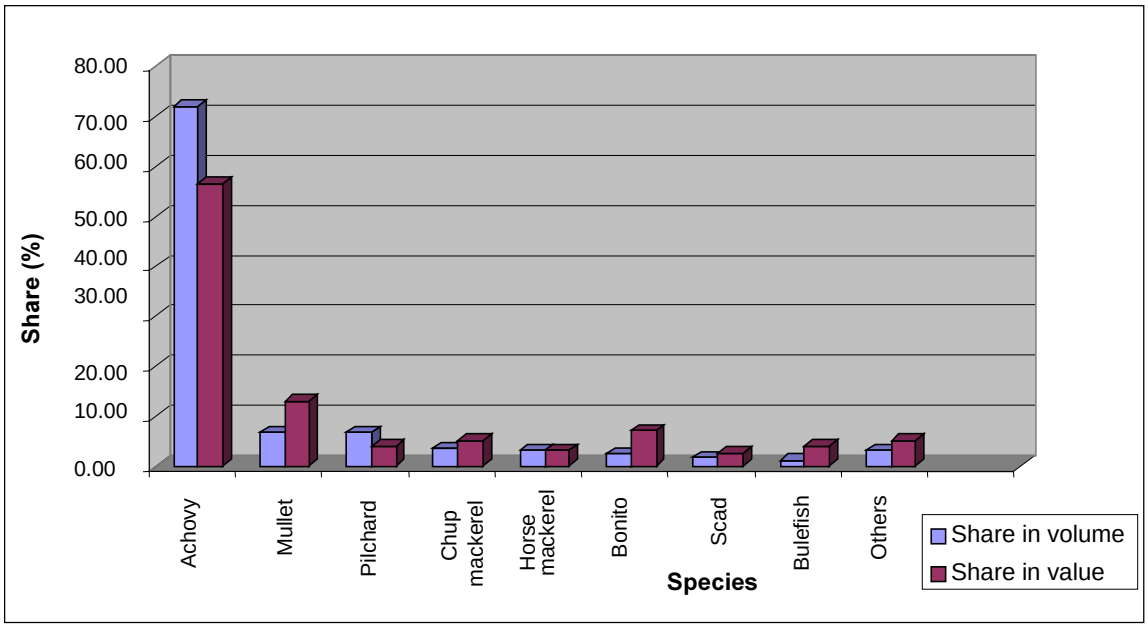

Fig. 7. Breakdown of pelagic fish landings in volume and value in1997 (share in %) (based on data from Anonymous, 1998a).

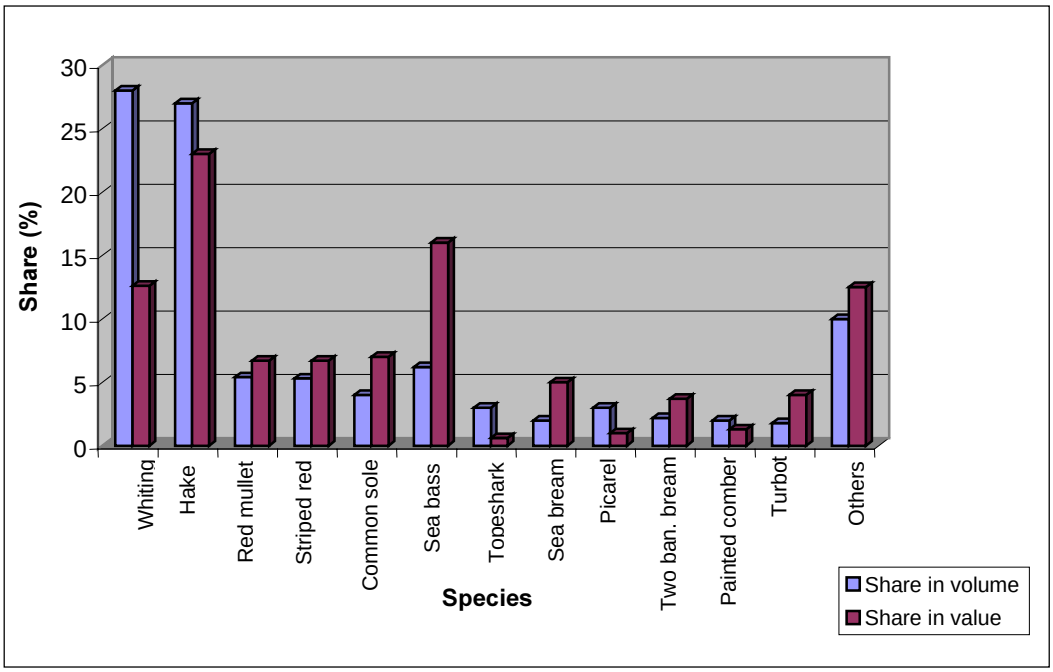

Fig. 8. Breakdown of non-pelagic species landings in volume and value in 1997 (share in %) (based on data from Anonymous, 1998a).

Mullet *(Chalcalburnus tarichi*) and common carp constituted 47% and 34% of freshwater fisheries landings in volume and 45.5% and 37% in value in 1997 respectively. The overall volume and value of freshwater landings were 47,000 t and 111,280,000 US$ respectively in 1997.

The volume of shellfish landings in 1997 amounted to 17,210 t and the value of harvest was estimated as 27,698,000 US$. Shellfish landings were dominantly composed of cockle, mussel and sea snail both in terms of volume and value.

Crustacean landings amounted to 2903 t and valued at 16,259,000 US$ in 1997. Shrimp and crayfish being top two products in 1997.

As far as cephalopods landings are concerned octopus, cuttlefish and long finned squid comprised 43%, 39% and 18% of the harvest in volume and 48%, 23% and 29% in value respectively in 1997. With the overall volume being 2320 t and value being 6,620,000 US$.

Aquaculture

Aquaculture is a relatively recently established sector in Turkey, starting from 1980's and showing a rapid growth in 1990's. Both freshwater and marine aquaculture are practised, with number of licensed farms increasing from 70 in 1985 to 895 in 1997 (Emre and Kürüm, 1998). Aquaculture production also increased from 4100 t in 1988 to 45,450 t in 1997 (Fig. 9), with the consequent share of aquaculture in overall supply of aquatic products, rising from 1% in 1988 to 10% in 1997.

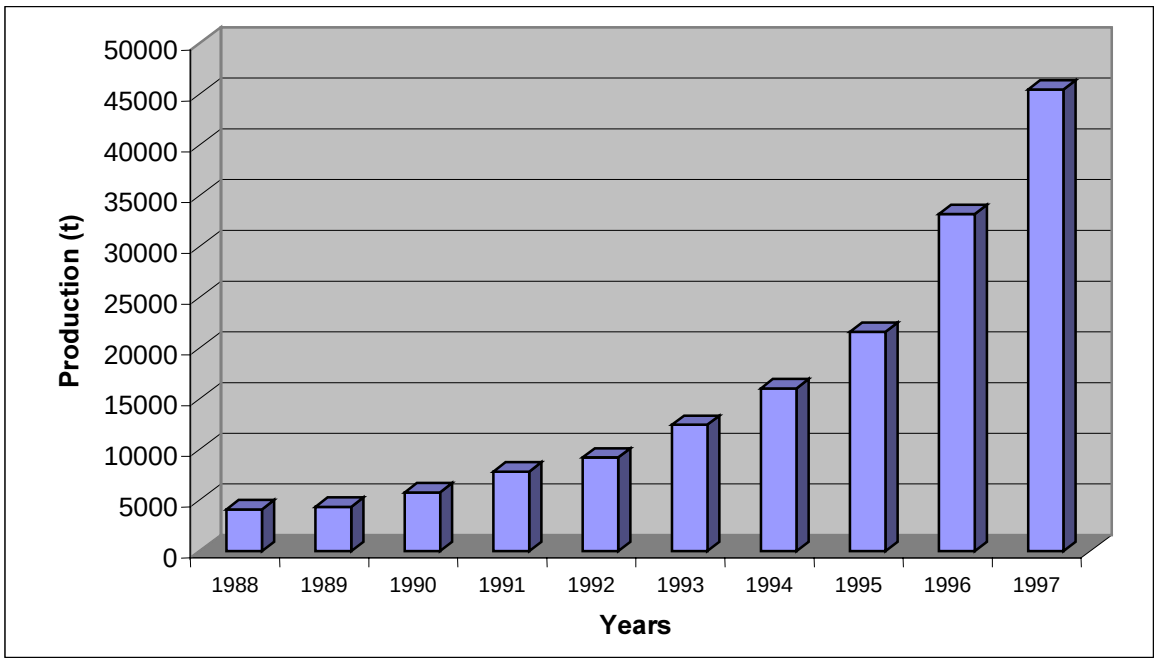

Fig. 9. Aquaculture production of Turkey between 1988-1997 (based on data from SIS, Fisheries Statistics, various years).

Aquaculture species of interest to Turkey are all indigenous or have been introduced some years ago and are now well established (Anonymous 1994b). These are: rainbow trout (*Oncorhynchus mykiss*), sea bream *(Sparus aurata*), sea bass *(Dicentrarchus labrax*), common carp *(Cyprinus carpio*), shrimp (*Penaeidae* spp.) and mussel (*Mytilus galloprovincialis*) (Fig. 10).

Salmonids and, namely, rainbow trout constitute the backbone of aquaculture in Turkey. Though, Atlantic salmon (*Salmo salar*) was introduced to Turkish aquaculture sector in early 1990's, the attempts to produce this species in the Black sea were unsuccessful due to unfavourable climatic and mainly high water temperatures in summer months. Fisheries statistics indicate a production of 50 t in 1997, but this figure seems to be rather theoretical. Therefore, rainbow trout constitutes the bulk of farmed fish production in Turkey. The average share of rainbow trout in overall aquaculture of production of Turkey was 55% between 1988-1997. With the exception of few marine cage units,

almost all the rainbow trout farms are land-based units involved in production of portion size trout. 93% of trout farms in Turkey have their own hatchery units (Rad, 1999). Generally no processing or value-adding is the case in trout farming in Turkey and trout is marketed as fresh fish. Few farms running their own processing units are involved in production of smoked trout, but their production is more export-driven. Only 0.5% of trout farms produce fresh, frozen or smoked fillets. 70% of trout farms do not apply and processing (Rad, 1999).

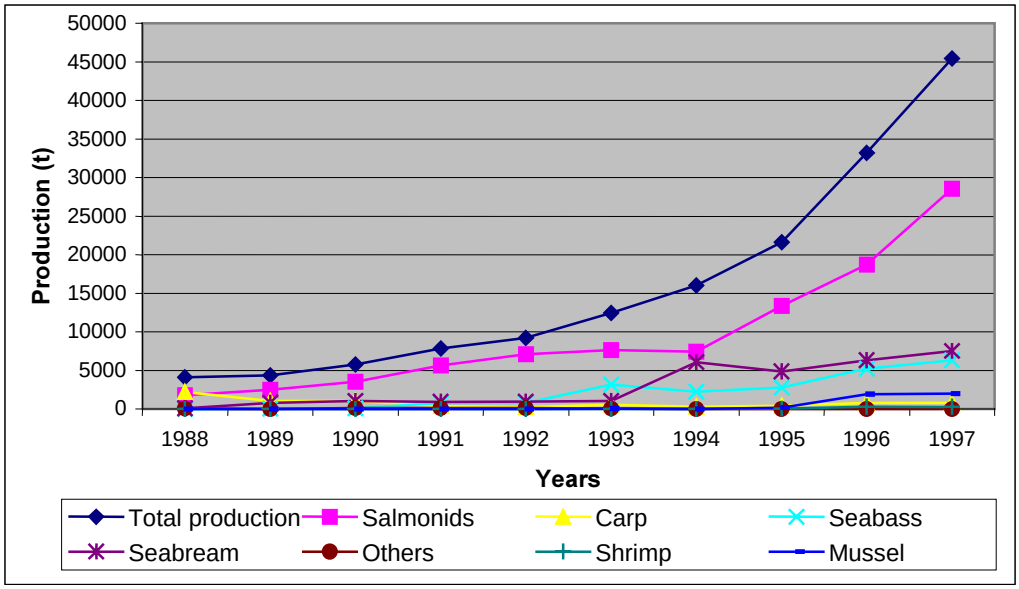

Fig. 10. Trends in aquaculture production of Turkey between 1988-1997 (based on data from SIS, Fisheries Statistics, various years).

Increase in number of farms, better managerial skills on farm level and use of summer eggs have all contributed to increase in domestic supply of rainbow trout since 1995, while no marketing or promotion actions have been carried out to increase the domestic demand in recent years. The consequent outcome of this unbalanced supply and demand pattern has been declining prices and profit margins in trout farming industry in the past 3 years, with wholesale prices as down as 1.2 US$/kg in 1999 in Ankara. Trout wholesale prices are higher this year, being around 2.2 US$/kg in September. Trout farms are spread all over Turkey, with the bulk of the production coming from Black sea, Aegean and Marmara regions.

Though there are a number of large-scale farms with annual production capacities of over 1000 t, the average farm size was 26.4 t/year in 1996. 85% of trout farms in Turkey are regarded as small-scale farms with production capacities below 30 t/year. Medium-scale farms (30-100 t/year) constitute 11.8% of the Turkish trout farms, while 2.7% of farms have production capacities above 100 t/year (Rad, 1999).

With no doubt, rainbow trout is the most well known farmed fish in Turkey. In recent years with declining prices rainbow is no longer regarded as a luxury fish and competed with anchovy and imported mackerel in 1999 as far as prices are concerned.

Production of farmed carp has been showing a declining trend ever since 1991, due to increase in production of capture fisheries and declining prices, making farming of this species economically unfeasible. Furthermore, carp is not very much appreciated by Turkish consumers and much of the consumption is confined to inner regions of Turkey and low income groups.

In early 1990's mariculture and, namely, sea bass and sea bream farming emerged as an attractive and profitable investment. Farming started to develop in Turkey as in other Mediterranean countries. Sea bass and sea bream on-growing is dominantly carried out in floating cages along Turkish coast on the Aegean sea and the Mediterranean.

As in the case of rainbow trout farming the approach of policy makers was production stimulating, neglecting the market and marketing aspects of the mariculture. Consequently, production increased from 105 t in 1988 to 13,800 t in 1997. Trend indices for production of sea bass and sea bream are given in Table 3.

Table 3. Production indices for sea bass and sea bream (from Rad and Köksal, 1998)

Year	Sea bass		Sea bream	
	t	Index (1994 = 100)	t	Index (1994 = 100)
1991	777	35	910	15
1992	808	36	937	15
1993	3158	142	1029	17
1994	2229	100	6070	100
1995	2773	125	4847	80
1996	5210	234	6320	104
1997	6300	283	7500	124

As it can be seen in Table 3, the relative growth in sea bass production has been greater since 1994 due to reliable supply of hatchery produced juveniles making production planning possible. The pattern of growth has been less stable for sea bream production where on-growing operations has been more dependent on catches of wild juveniles. It should also be mentioned that as in the case of other countries hatchery operations for sea bass have been more successful than for sea bream, thus increasing the reliance of on-growing operations on catches of wild juveniles. Though, according to a new decision by Ministry of Agriculture the catches of wild sea bass and sea bream juveniles will be forbidden starting from year 2001. This decision will benefit hatchery owners who were forced to compete with wild juvenile catchers and to decrease juvenile prices. Low juvenile prices due to wild catches has influenced economic feasibility and sustainability of hatchery operations in Turkey negatively, forcing some operators to stop operation.

Mariculture in Turkey is export-oriented. The domestic market for these two species are mainly confined to the Aegean and Mediterranean regions and Istanbul. Unpredictability of supply level (due to dependence of on-growing operations on wild juvenile stocks) and the dependence of demand on fluctuating export levels have prevented the formation of a stable supply and demand model in sea bass and sea bream farming. Prices at home have also been affected by developments in export markets and showed a declining trend since 1993. The weighted aggregate price index for sea bass and sea bream are given in Table 4.

Table 4. Weighted aggregate price index for sea bass and sea bream (from Rad and Köksal, 1998)

Year	Average price (US$/kg)		Fisher's ideal price index
	Sea bass	Sea bream	1992 = 100
1992	17.5	14.0	100.0
1993	7.8	5.0	41.0
1994	6.0	5.0	35.0
1995	6.2	5.7	38.0
1996	6.5	5.6	38.5
1997	6.3	5.4	37.0

Shrimp farming is not developed in Turkey mainly due to climatic, technical and economic reasons. Longer on-growing season and consequent higher production costs compared with major producing countries, unable Turkey to compete with other suppliers within the same market. A major shrimp farm in Turkey stopped operation due to economic reasons in 1999.

Mussel farming seems to be a promising sector for Turkey. 2000 t of farmed mussel production is reported in 1997. Domestic consumption is not very significant and the out coming production will be export driven.

Bulk of R&D activities towards the commercialization of potential candidate species for aquaculture in Turkey are concentrated on marine fish species. Majority of the new and potential candidates are high-priced indigenous species and already have an established domestic and export markets. Species for which R&D activities are going on and are considered as new candidates for the near future include; Black Sea turbot (*Scophthalmus maeoticus)*, common porgy (*Pagrus pagrus*), common dentex *(Dentex dentex*), sharpsnout sea bream (*Puntazzo puntazzo*), two banded bream (*Diplodus vulgaris*), grouper (*Epinephelus aeneus*), Mediterranean yellowtail *(Seriola dumerilii*), *Lithognathus mormyrus* and leer fish (*Lichia amia*) (personal communication) (Rad, 2000).

1998 production figures

Turkish aquaculture production amounted to 56,700 t in volume and 271 million US$ in value. Breakdown of aquaculture production in 1998 is given in Fig. 11.

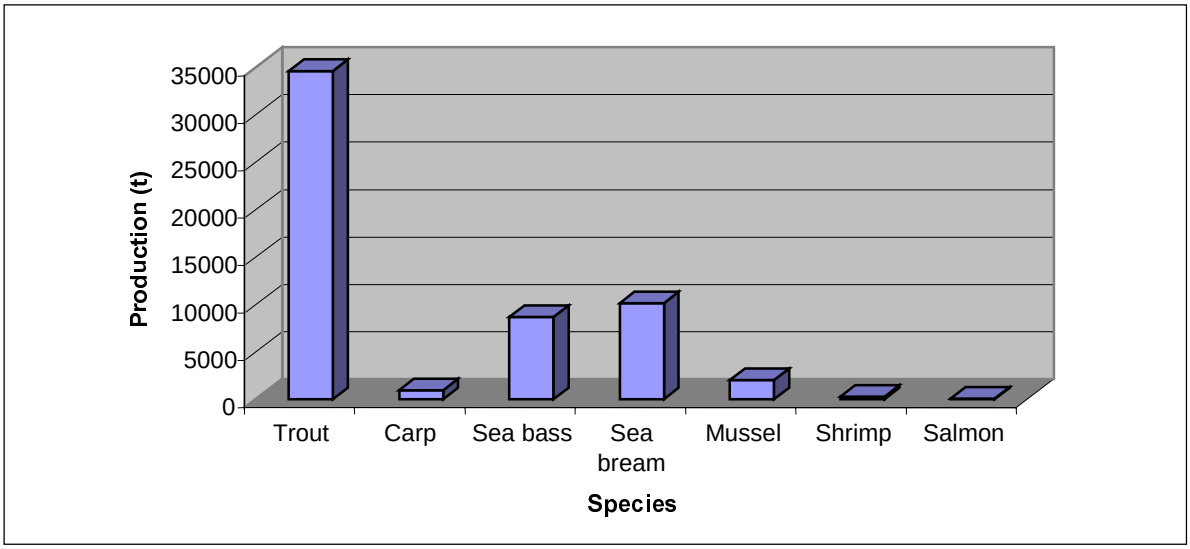

Fig.11. Breakdown of Turkish aquaculture production in 1998 (based on data from Şenel *et al.,* 2000).

In 1998 rainbow trout, sea bream and sea bass continued to comprise the bulk of Turkish aquaculture production. 32,340 t of portion sized rainbow trout and 2290 t of large rainbow trout (salmon trout) were produced in 1998. Production of sea bass and bream were 8660 and 10,150 t respectively in 1998.

The demand for salmon trout is increasing. Tough marine conditions and high water temperatures in the Black sea (on-growers are forced to harvest their fish in May or June when they are about 0.75-1.5 kg in size) are two major factors limiting the production. Recently some freshwater land-based trout farms have also started to produce large sized trout (600-750 g) with the aim of product diversification and profit maximization.

Rainbow trout will continue to be the backbone of Turkish aquaculture sector. However, increasing supply, stagnant demand and consequent competition may create some instability. Small and large-scale farms seem to be more advantageous when compared to medium-sized farms. Because small-scale farms have the advantage of local market and at-farm-gate sales, while the large-scale ones have the advantage of economy of scale and better financial structure.

Being an export driven sector mariculture (sea bass and sea bream) in Turkey is more susceptible to external factors, e.g. EU decisions, export markets. Following EU decision to ban seafood imports from Turkey in 1998, sea bass and sea bream producers faced many financial problems. These

negative developments had though some positive outcomes. Industry is now more concerned with demand stimulating policies, promotion, advertising, species and product diversification. Specially, species diversification and promoting domestic consumption seem to be two important keys for Turkish mariculture as far as economic sustainability is concerned.

Foreign trade (import and export)

The foreign trade data presented below cover 1991-1997 import and export statistics (for human consumption) in terms of volume of trade and 1992-1997 statistics in terms of value of trade due to lack of comprehensive foreign trade statistics for years 1988-1990. Canned shellfish, crustaceans and cephalopods have not been included to avoid biases due to lack of consistent and detailed data on canned products. Moreover, the item "other" in export statistics has occasionally made the species differentiation and presentation of precise data, for non-pelagics and shellfish, impossible (see section on methodology).

Both Turkish imports and exports have been enjoying an upward trend since 1991. Imports of aquatic products in terms of landed weight increased from 24,201 t in 1991 to 43,544 t in 1997. During the same period volume of exports increased from 15,386 t to 46,992 t (Fig. 12).

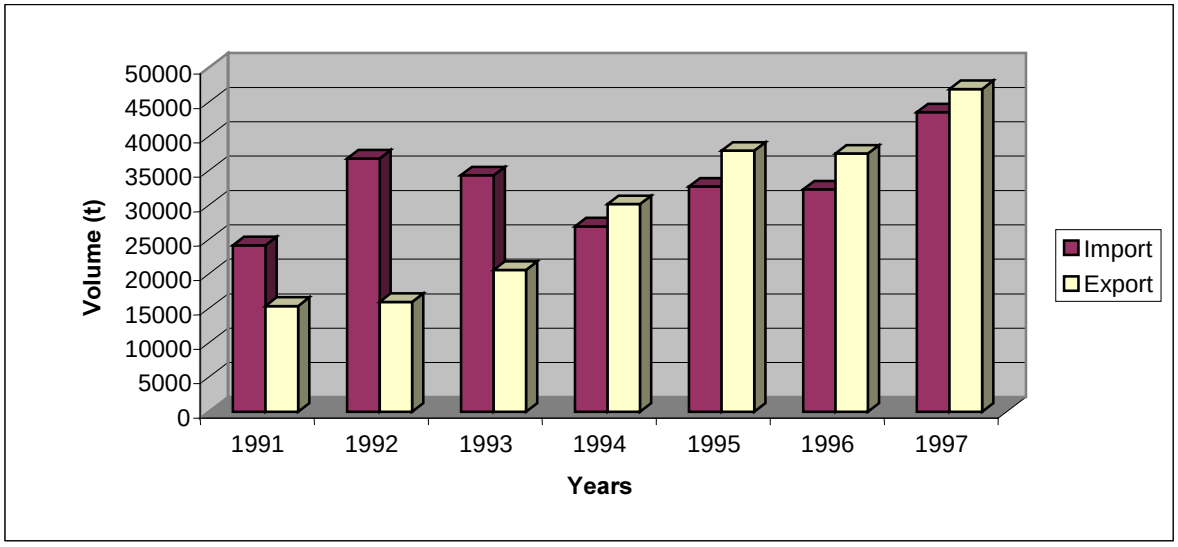

Fig. 12. Trends in volume of Turkish import and export of aquatic products (t, landed weight) (based on data from SIS, Fisheries Statistics, various years).

In terms of value of trade, imports of aquatic products increased from 16.1 million US$ in 1992 to 50.5 million US$ in 1997 while exports rose from 43.8 million US$ to 110.1 million US$ in the same period (Fig. 13).

Imports

Pelagic fish species and, namely, tuna and mackerel constitute bulk of Turkish seafood imports for human consumption.

Following the establishment of two large-scale canneries the import of frozen tuna have been steadily increasing in Turkey. The majority of frozen yellowfin and skipjack tuna imported is from the Indian Ocean, caught by Spanish fleet. Decline in anchovy landings has promoted the import of frozen mackerel particularly from Norway since 1983. Mackerel is also imported in smaller quantities from Scotland, Ireland, Holland, Denmark and recently from Russia (Anonymous, 1996a). Mackerel is consumed domestically while canned tuna is also an important export item.

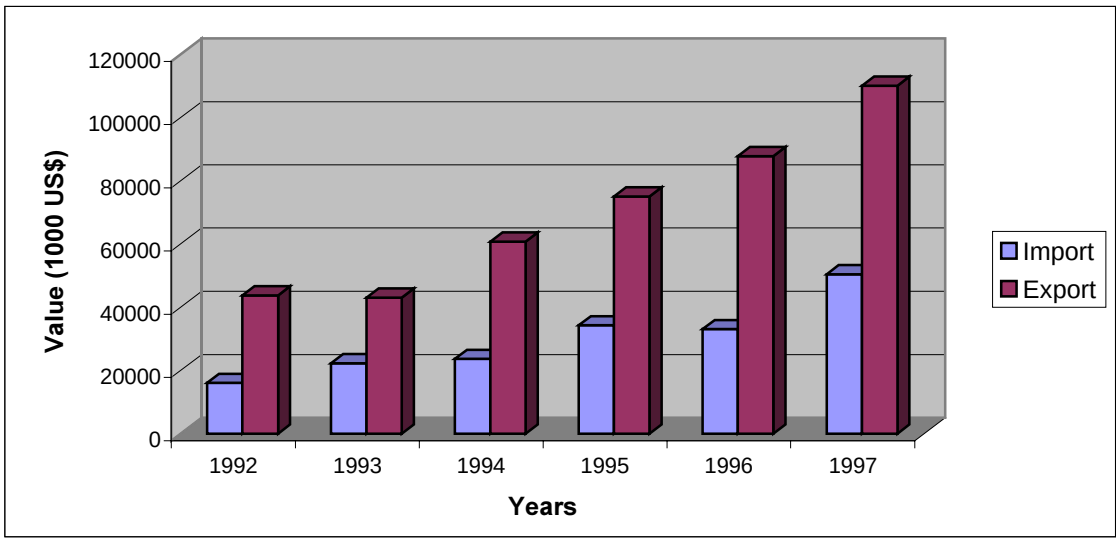

Fig. 13. Trends in value of Turkish import and export of aquatic products (1000 US$) (based on data from SIS Fisheries statistics, various years).

Sea snail (top shell) is another important item in Turkish imports of aquatic products. Sea snail imported from Russia, Bulgaria and Romania is processed and re-exported to Far East. Frozen mussel imported from Vietnam, is also re-exported. India originated cuttlefish and squid are consumed domestically (Anonymous, 1996a).

The breakdown of Turkish imports by species groups between 1991-1997 are shown in Fig. 14. Pelagic fish species were the dominant group of aquatic products imported with an upward trend. Though imports of non-pelagics also steadily increased, reaching 3300 t in 1997. Import of salmonids and freshwater species though enjoying a upward trend, remained to be low. Import of shellfish showed fluctuations, reaching 1900 t in 1994 and going down to 835 t in 1997. Crustaceans imports were low, being around 100 t between 1995-1997. Cephalopods imports increased from 317 t in 1991 to 920 t in 1997.

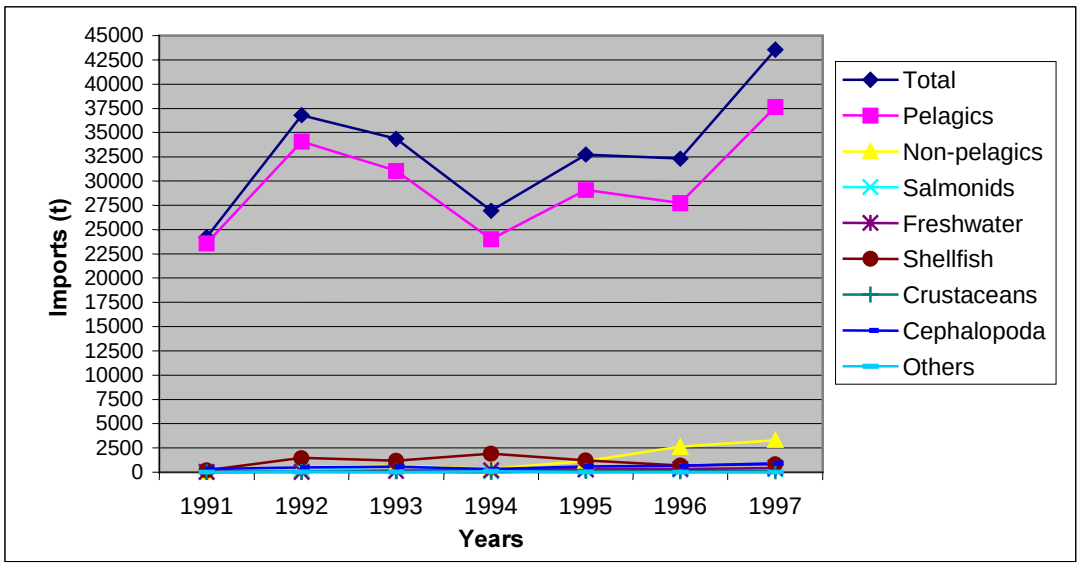

Fig. 14. Breakdown of Turkish imports of aquatic products between 1991-1997 (volume t, in landed weight) (based on data from SIS, Fisheries Statistics, various years, and Babadoğan, 1998).

In monetary terms, Turkish imports of aquatic products increased from 16.1 million US$ in 1992 to 50.5 million US$ in 1997. Pelagic fish species constituted 88% of Turkish imports between 1992-1997 in terms of value (Fig. 15).

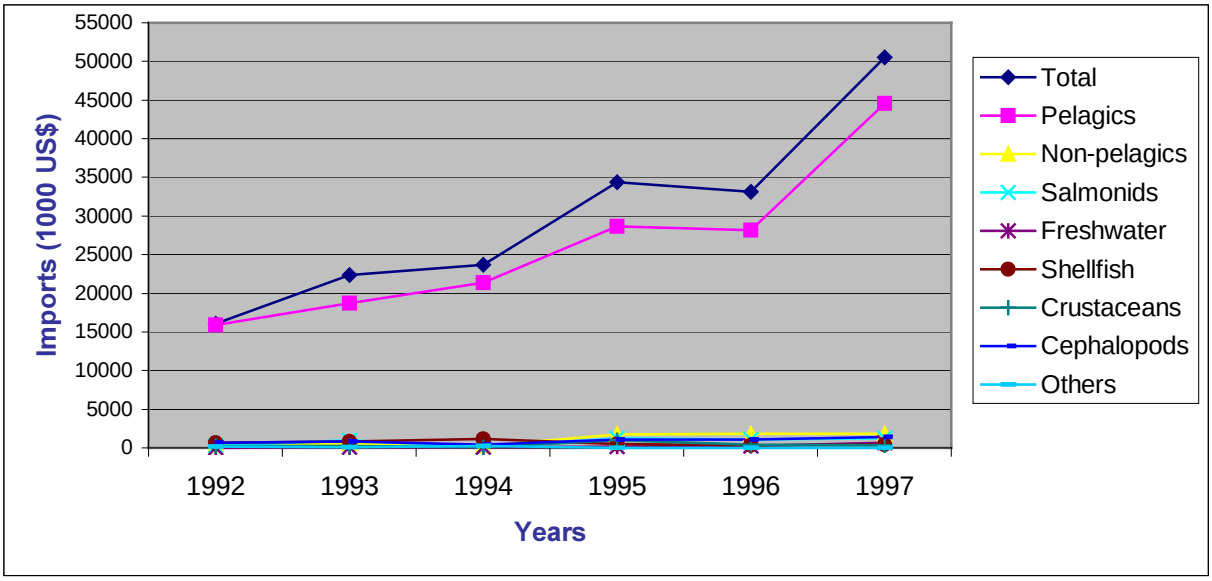

Fig. 15. Breakdown of Turkish imports of aquatic products between 1992-1997 (value 1000 US$) (based on data from SIS, Fisheries Statistics various years and Babadoğan, 1998).

The share of non-pelagic species increased from 2.5% in 1992 to 5.5% in 1996, with the average being 3.3% between 1992-1997. Though cephalopods imports increased from 644 million US$ in 1992 to 1.4 million US$ in 1997, their share decreased from 4.0% in 1992 to 3.3% in 1997.

Exports

Turkish exports of aquatic products enjoyed an upward trend between 1992-1997 both in terms of volume and value, reaching 46,922 t and 110.1 million US$ in 1997 (Figs 16 and 17).

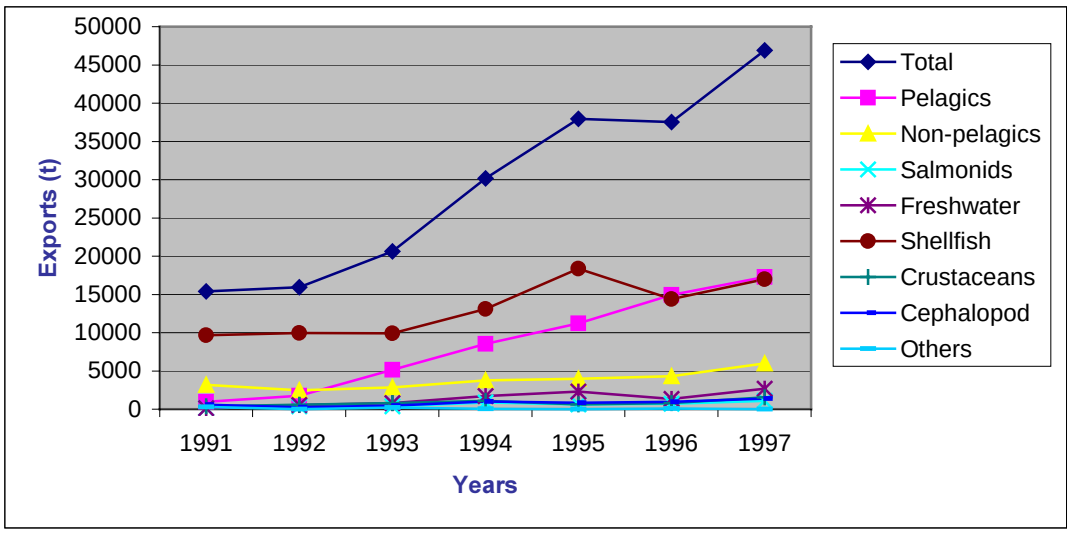

Fig. 16. Breakdown of Turkish exports of aquatic products between 1991-1997 (volume t, landed weight) (based on data from SIS, various years, and Babadoğan, 1998).

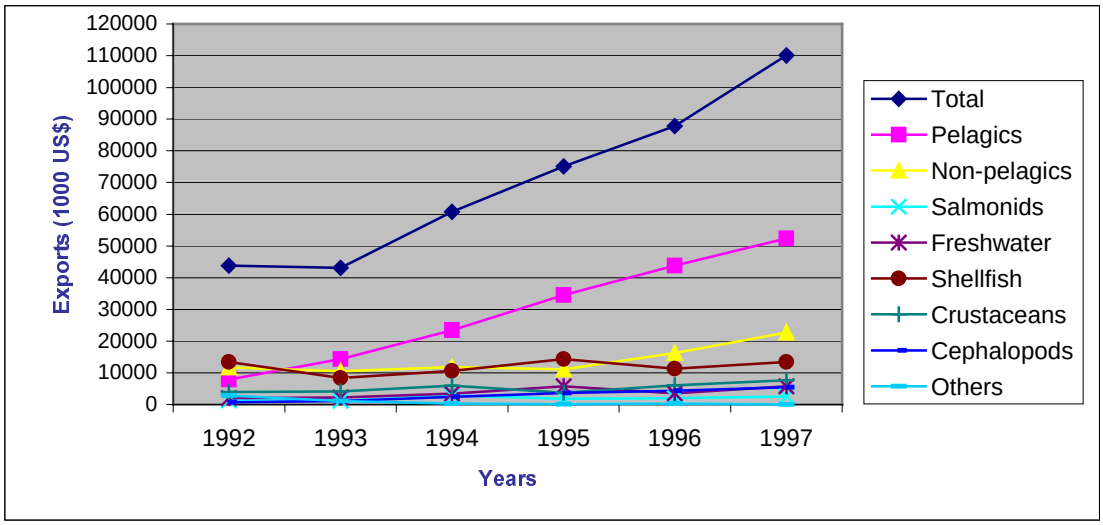

Fig. 17. Breakdown of Turkish exports of aquatic products between 1992-1997 (value, 1000 US$) (based on data from SIS, various years, and Babadoğan, 1998).

Both in terms of quantity and share, pelagic fish species, non-pelagics and shellfish were the dominant export items of Turkey Between 1991-1997.

The volume of Turkish exports of pelagic fish species increased from 951 t in 1991 to 17,271 t in 1997, with their share also rising from 6.0% in 1991 to 37.0% in 1997. Canned fish and mainly tuna constituted the bulk of the export. Turkish exports of canned fish increased from 4042 t in 1993 to 14,187 t in 1997 (Babadoğan, 1998). Canned, frozen fillets and salted anchovy exports were the second important export items of pelagic fish.

Farmed sea bream and bream bass were the dominant export items of non-pelagic fish species in the recent years, generally exported as chilled fish. Mussel, sea snail (top shell) and cockles were the most important export items among shellfish. While shrimp and crayfish constituted the bulk of the crustaceans exports. Smoked rainbow trout fillets and frozen fillets of pike-perch comprised main export items of salmonids and freshwater fish species.

Turkish exports of aquatic products increased from 43.8 million US$ in 1992 to 110.1 million US$ in 1997, with pelagic fish species, non-pelagics and shellfish exports comprising the main items (Fig. 17).

The value of export of pelagic fish species increased from 7.8 million US$ in 1992 to 52.4 million US$ in 1997, with their share in over all value of exports rising from 18.0% to 48.0% in the same period. Canned tuna fish, undoubtedly comprised the bulk of the export of pelagic products. Turkish exports of canned tuna amounted to 45.6 million US$ in 1997, corresponding to 87% of the value of exports of pelagic fish.

The average share of non-pelagic fish species in Turkish exports of aquatic products was 21.0% between 1992-1997 and more or less stable due to export of farmed sea bream and sea bass.

Shellfish exports reached 13.4 million US$ in 1997, with an average share of 18.5% between 1992-1997.

Export of freshwater fish species and mainly frozen pike-perch fillets reached 5.7 million US$. Exports of rainbow trout smoked and frozen fillets were comparatively stable throughout 1992-1997, being around 2.0 million US$.

1997 import and export figures

Imports

In 1997 Turkish imports of aquatic products for human consumption amounted to 43,544 t (landed weight) and 44.6 million US$.

The breakdown of Turkish imports of aquatic products are given in Fig. 18.

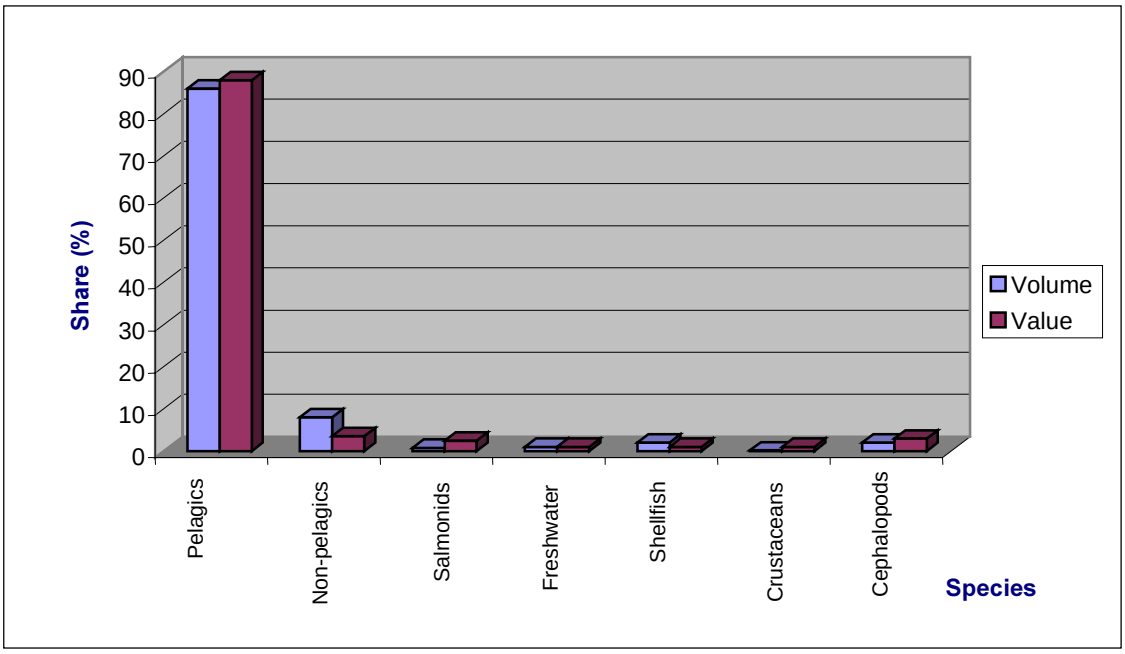

Fig. 18. Breakdown of Turkish imports of aquatic products in 1997 (share in %) (based on data from Anonymous, 1998a).

Pelagic fish species (mainly tuna) and non-pelagics constituted 86.0% and 8.0% of the volume of Turkish imports of aquatic products .

The breakdown of pelagic species are given in Fig. 19. Frozen tuna comprised 84.0% of Turkish imports of pelagic fish in volume and 89.0% of the imports in value (Fig. 19).

Atlantic and chup mackerel constituted 7.0% of the imports in terms of volume and 5.2% of the imports in terms of value (Fig. 19). The share of anchovy remained to be 6.5% in volume and 4.0% in value.

As far as non-pelagic fish imports are concerned hake, European hake, whiting and sole comprised 75.0%, 14.0%, 5.0% and 1.0% of the imports in volume respectively in 1997. Their shares in terms of value of imports were 67.0%, 11.0%, 4.0% and 2.0% respectively (Fig. 20).

Exports

Turkish exports of aquatic products reached 46,922 t in volume (landed weight) and 110.1 million US$ in value in 1997.

Pelagic fish species, non-pelagics and shellfish were the main exporting items in 1997 with their shares in quantity of exports being 37.0%, 13.0% and 36.0% respectively. In terms of monetary value, pelagic fish species, non-pelagics and shellfish comprised 48.0%, 21.0% and 12.0% of the exports (Fig. 21).

Among pelagic fish species, tuna constituted 94.5% of the export in volume and amounted to 98% of the exports in value. Tuna was mainly exported as canned and frozen fish. In 1997 Turkey's canned fish exports reached 45.6 million US$. Anchovy comprised 4.5% of the exports in quantity but made up only 1.5% of the exports in value (Fig. 22).

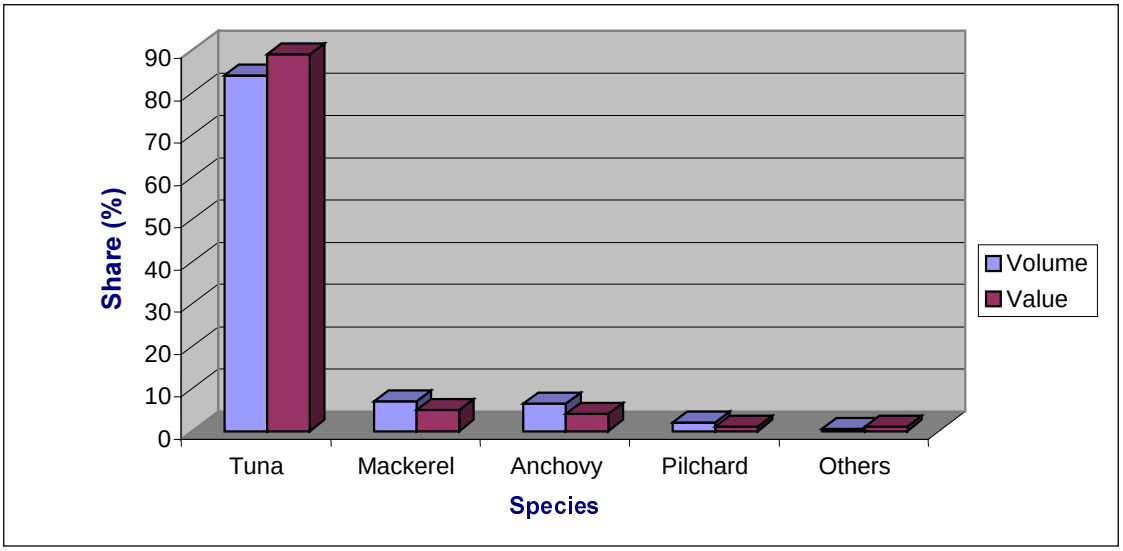

Fig. 19. Breakdown of Turkish imports of pelagic fish species in 1997 (share in volume and value) (based on data from Anonymous, 1998a).

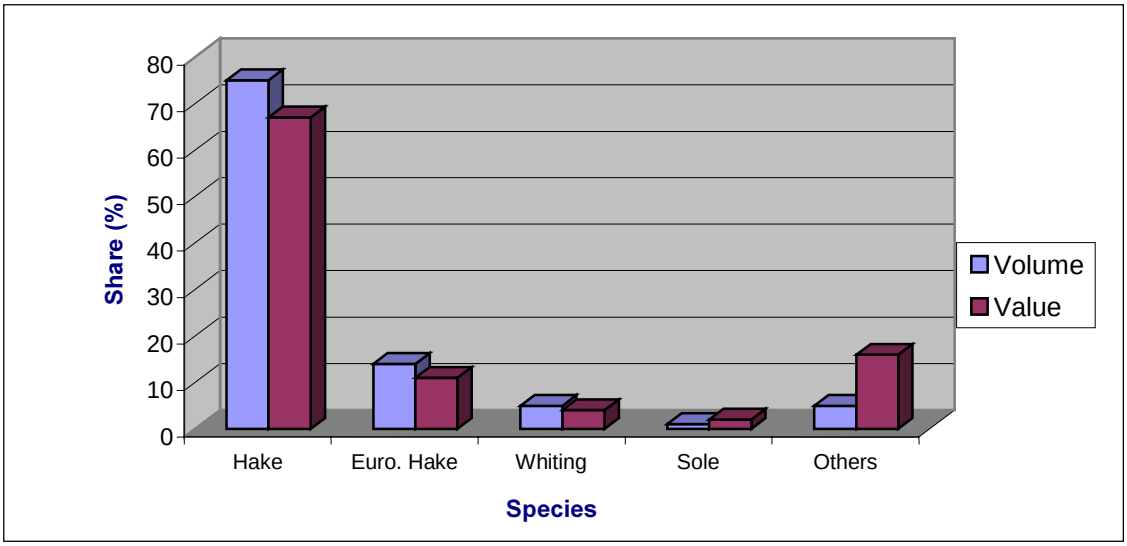

Fig. 20. Breakdown of Turkish imports of non-pelagic fish species in 1997 (share in volume and value) (based on data from Anonymous, 1998a).

It is difficult to give precise data for export of non-pelagic fish species due to confusing data. An aggregate export item (PC 30269990019) of 3123 t and valued as 8.6 million US$ was recorded as "other marine fish" in 1997 export statistics, making it impossible to identify the species. This item comprised 52.0% of non-pelagic fish exports of Turkey in volume, and comprising 38.0% of the value of non-pelagic fish exports (Fig. 23).

Apparently sea bream and sea bass constituted 27.0% and 10.0% of the non pelagic fish exports in 1997 in terms of quantity respectively. The shares of these two species in terms of value of exports

were 38.5% and 16.0% respectively. Two other important export items among non-pelagic fish species were shark and whiting (Fig. 23).

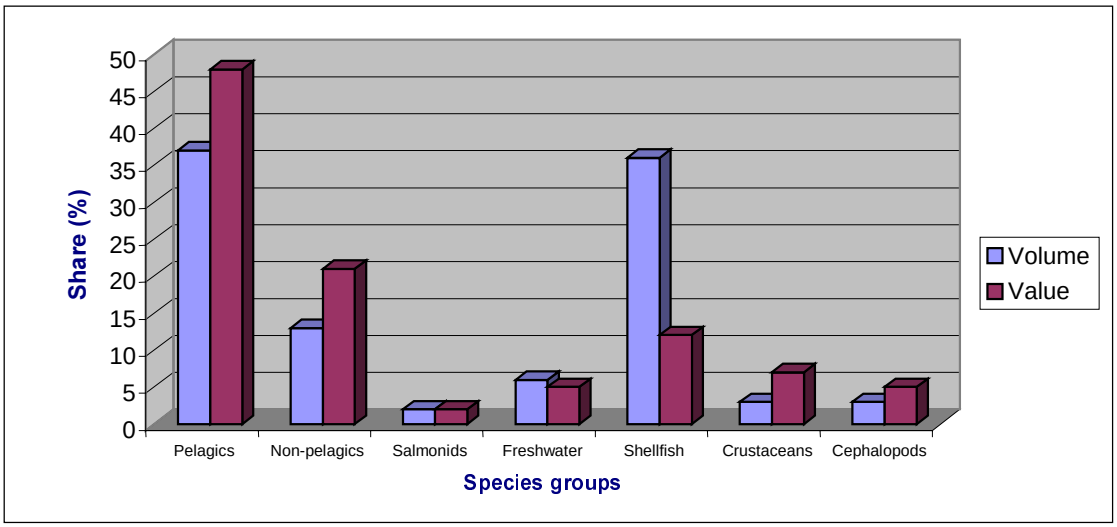

Fig. 21. Breakdown of Turkish exports of aquatic products in 1997 (share in %) (based on data from Anonymous, 1998a).

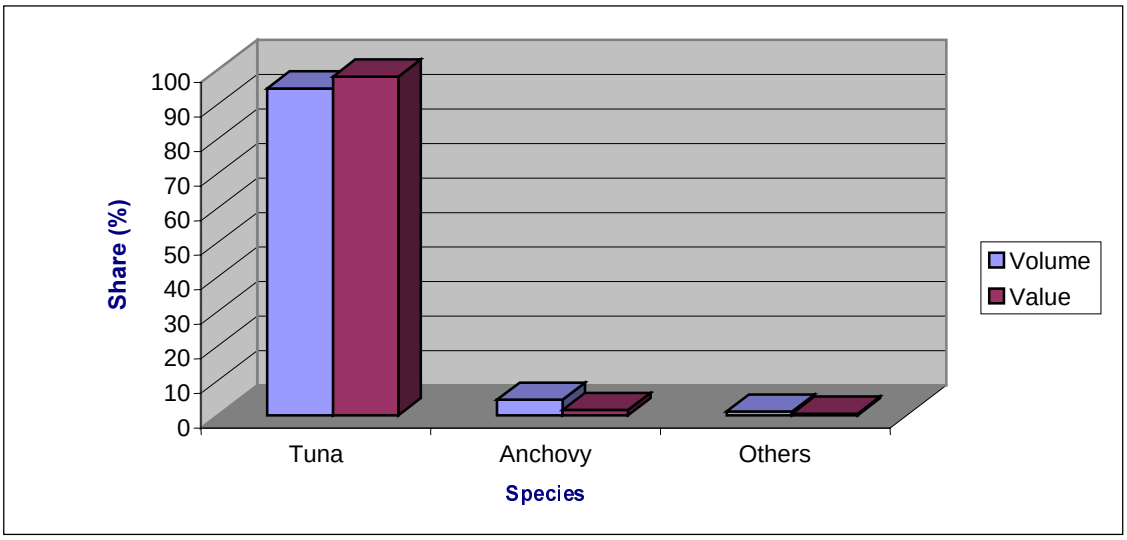

Fig. 22. Breakdown of Turkish exports of pelagic fish species in 1997 (share in %) (based on data from Anonymous, 1998a).

Confusing data are also the case for shellfish exports as far as sea snail (top shell) is concerned. It has not been possible to come across "sea snail" in export or import statistics. It seems that the term "other frozen molluscs" refers to top shell (PC 30799901000). This item amounted to 9614 t in 1997, constituting 56.5% of the exports in quantity and 54.0% of the exports in terms of value. Mussel, cockle, scallop and oyster comprised the remaining 43.5% in volume and 46.0% in value (Fig. 24).

Consumption of aquatic products

The lack of precise import and export data prevented the quantification of consumption for each species and specifically for non-pelagics and shellfish. In the case of non-pelagics and shellfish it has not been possible to quantify exports of all species to compute the consumption (production + import –

export) for 1997. As mentioned earlier, 3123 t of non-pelagic fish species were exported as "other marine fish". Therefore, species which might had been exported, and not appearing as exported, appear to be consumed domestically. The consequent out come is over-estimation of domestic consumption which can not be mathematically justified by production + imports. The same shortcoming is also applied for shellfish. It has not been possible to estimate the export and domestic consumption of sea snail and others precisely.

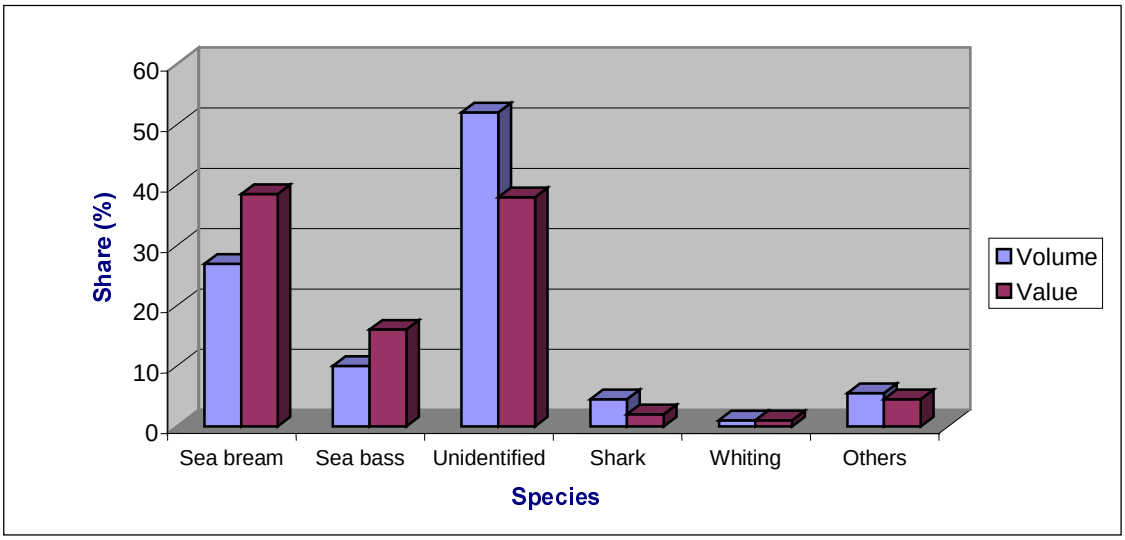

Fig. 23. Breakdown of Turkish exports of non-pelagic fish species in 1997 (share in %) (based on data from Anonymous, 1998a).

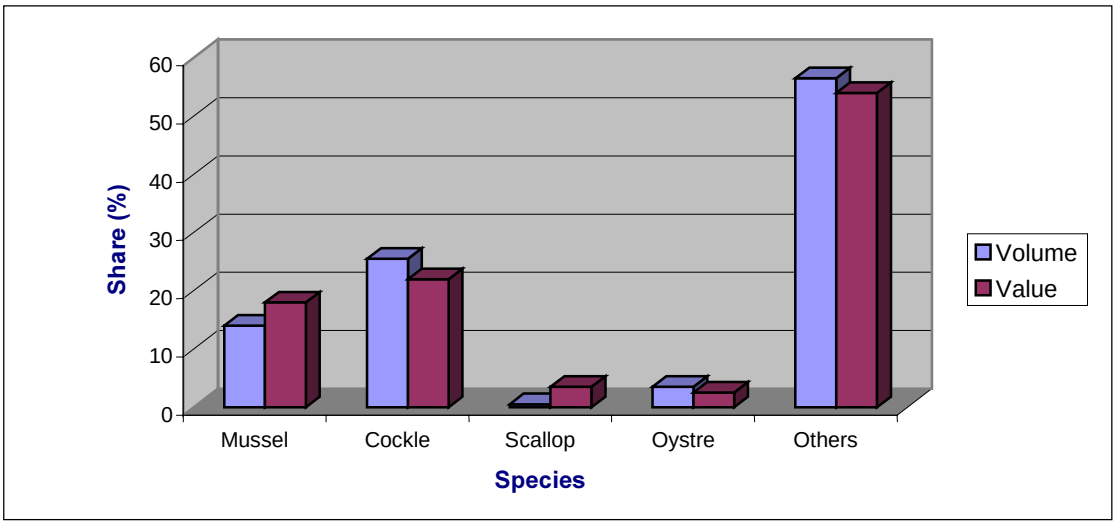

Fig. 24. Breakdown of Turkish exports of shellfish in 1997 (share in %) (based on data from Anonymous, 1998a).

Due to unavailability of import and export data for years 1988-1991, it has not been possible to quantify the aggregate consumption of species groups for years 1988-1991. Furthermore, lack of price time series for years 1988-1995, prevented the quantification of the value of production and consequent quantification of consumption in monetary terms for above mentioned years. Turkey's estimated consumption of aquatic foods for 1992-1997 are presented in Fig. 25.

Between 1992-1997 the average shares of pelagics, non-pelagics, salmonids, freshwater, shellfish,

crustaceans and cephalopods species in consumption of aquatic products in Turkey were 70.5%, 14.0%, 3.0%, 8.0%, 3.5%, 0.5% and 0.3% respectively.

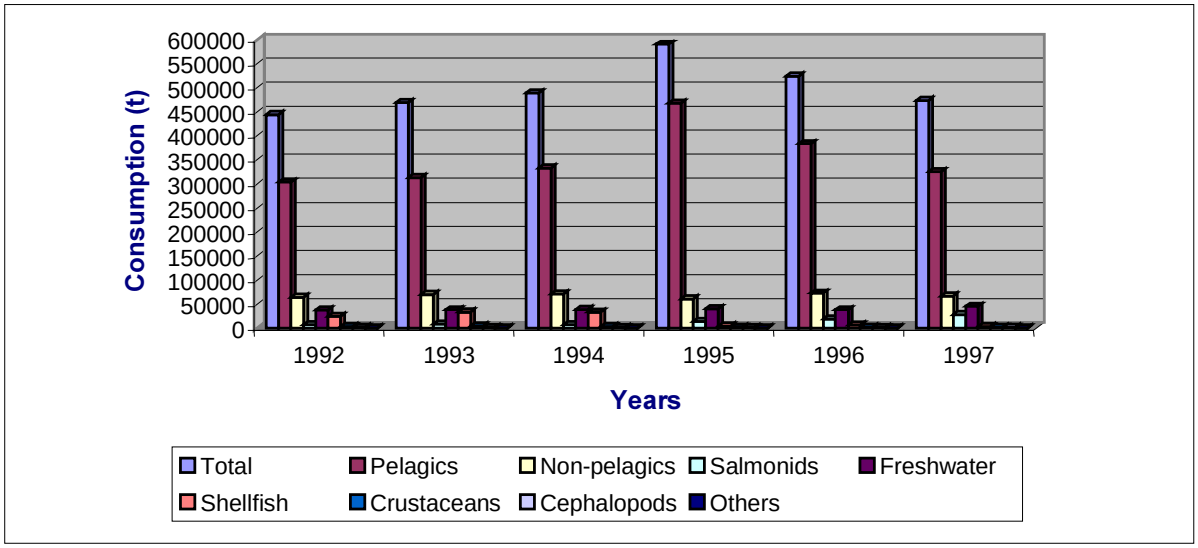

Fig. 25. Breakdown of Turkey's consumption of aquatic foods between 1992-1997.

The shares of pelagic, non pelagics and freshwater species were more or less stable varying between 68.0-79.0%, 10.0-15.0% and 7.3-9.5% respectively.

The share of salmonids and namely rainbow trout increased from 1.5% in 1992 to 6.0% in 1997. This trend is the outcome of increase in production of farmed trout in Turkey in the recent years.

The share of shellfish decreased from 7.0% in 1993 to 0.6% in 1997. This is the result of increase in Turkey's export of shellfish products namely mussel, cockle and top shell.

As far as crustaceans are concerned, their share in consumption remained to be around 0.4-1.0%. Crustaceans are not usually an appreciated food item in Turkey and are consumed by high income groups and through catering services. Cephalopods are also mainly consumed through catering services and are not an widely appreciated food item in Turkey.

The monetary values of consumption of aquatic foods in Turkey for 1996 and 1997 are given in Table 5.

Table 5. Breakdown of aquatic foods consumed in Turkey in 1996-1997 (value, 1000 US$) (based on price data from Anonymous, 1997, 1998a)

Year	Total	Pelagics	Non-pelagics	Salmonids	Freshwater	Shellfish	Crustaceans	Cephalopods	Others
1996	1,187,006	664,826	311,895	71,493	84,187	33,878	18,117	2506	104
1997	1,141,612	497,889	401,637	95,824	108,013	23,132	11,978	2623	516

1997 consumption figures

Consumption of aquatic products was 473,720 t in 1997. This consumption figure corresponds to 1.4 billion US$. In terms of quantity, 69.0% of consumption was composed of pelagic fish species, 14.0% of non-pelagics, 6.0% of salmonids (namely rainbow trout) and 9.5% of freshwater species in 1997 (Fig. 26). In terms of value pelagic fish species comprised 43.5% of the consumption while the share of non-pelagics was 35.0% (Fig. 26).

In monetary terms the share of rainbow trout in domestic consumption of aquatic foods was 8.5%.

Freshwater fish species constituted 9.5% of the aquatic foods consumption in Turkey in 1997. Shellfish, crustaceans and cephalopods comprised only 2.0%, 1.0% and 0.2% of the consumption in 1997 (Fig. 26). Breakdown of species consumed in 1997 are given in Table 6. Breakdown of non-pelagic fish species and shellfish are not presented due to inconsistent and contradictory data.

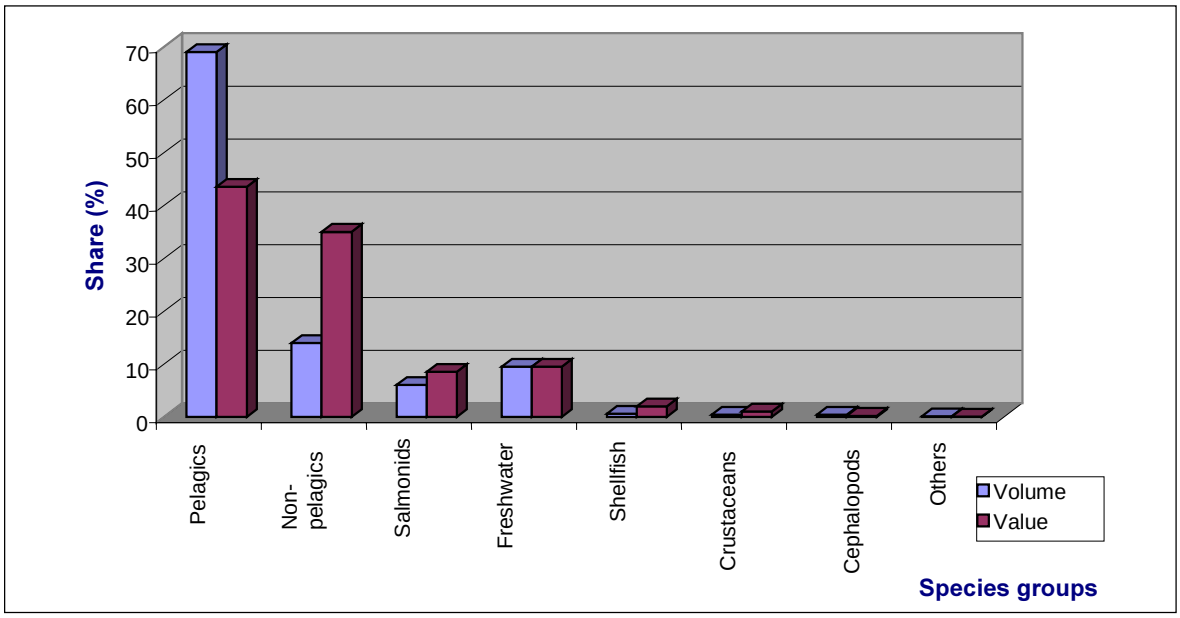

Fig. 26. Breakdown of consumption of aquatic foods in Turkey in 1997 (share in consumption %).

Table 6. Breakdown of pelagic, salmonids, freshwater, crustaceans and cephalopods species consumed in Turkey in 1997.

Category	Species	Quantity	
		Landed weight (t)	Share (%)
Marine (pelagics)	Total	325,935	
	Anchovy	221,704	68.0
	Grey mullet	20,500	6.0
	Pilchard	21,154	6.5
	Tuna	15,943	5.0
	At. & chup mackerel	13,902	4.3
	Horse mackerel	9,525	3.0
	Bonito	7,438	2.0
	Scad	5,100	1.5
	Blue fish	3,050	1.0
	Bogue	2,450	
	Leer fish	1,650	
	Silverside	640	
	Twaite shad	505	
	Sprattus sprattus	500	
	Gar fish	470	
	Atlantic bonito	410	
	Sword fish	383	
	Saupe	340	
	Euro. barracude	200	
	Others	71	

Table 6 (cont.). Breakdown of pelagic, salmonids, freshwater, crustaceans and cephalopods species consumed in Turkey in 1997

Category	Species	Quantity	
		Landed weight (t)	Share (%)
Salmonids	Total	27,969	
	Atlantic salmon	315	1.0
	Trout	27,654	99.0
Freshwater species	Total	45,544	
	Mullet	22,000	48.0
	Common carp	16,763	37.9
	Pike perch	32	
	Catfish	1,200	2.5
	Wels	1,000	2.0
	Eel	340	
	Pike	350	
	Others	3,859	8.5
Crustaceans	Total	1,745	
	Shrimp	938	54.0
	Crayfish	373	21.0
	Crab	341	19.5
	Lobster	69	4.0
	Others	24	1.5
Cephalopods	Total	1,865	
	Octopus	324	17.5
	Cuttle fish	512	27.5
	Squid	10,294	55.0

Characteristics of Turkish aquatic food market

Turkish aquatic or seafood market has not been well studied, neither by academic institutions nor by private or governmental institutions. Though there are few regional surveys covering a certain segment of the market (Elbek *et al.*, 1999; Saygı and Şengör, 1997) the only comprehensive survey of Turkish aquatic food market was carried out by Ministry of Agriculture and Rural Affairs (conducted by Macalister Elliott and Partners Ltd) with the financial support of World Bank and published in 1996. The information presented below generally reflects the findings of this survey.

Characteristics of consumers and fish consumption

General information

Annual per capita fish consumption is low in Turkey (around 7.5 kg in 1997), below the world average of 13 kg. Availability of fisheries products and dietary traditions appear to be the main factors limiting the consumption of fish. Though prices of many fish species are competitive with meat and poultry, Turkish consumers prefer the latter due to their ease of use in traditional dishes and wider availability. Per capita consumption of poultry and meat and frequencies of consumption are given in Tables 7 and 8. Nevertheless, analysis based on income distribution and socio-economic classes indicate that 98.5% of Turkish families surveyed consume fish at least once a year. Anchovy, rainbow trout and whiting are generally consumed by all groups and these 3 species along with horse mackerel characterize Turkish aquatic food market and can be regarded as "national" species. The fish consumption per household was reported as 28.9 kg for 1994 (Anonymous, 1996a). The list of most popular species consumed in 1994 are given in Table 9.

Awareness, preference and consumption scores for 12 key species are given in Table 10. Anchovy, trout, bonito, horse mackerel and whiting are the top five species preferred by Turkish consumers. Anchovy, horse mackerel, bonito, trout and blue fish are the most well known species among Turkish consumers.

Table 7. Per capita consumption of meat and poultry in Turkey (source: Akman, 2000; Anonymous, 1998b)

Year	Per capita consumption of meat (kg)	Per capita consumption of poultry (kg)
1990	17.8	3.85
1991	16.4	4.17
1992	17.0	4.96
1993	16.7	6.18
1994	16.3	4.94
1995	15.5	6.77
1996	14.7	8.89
1997	14.0	9.78
1998	–	9.67
1999	–	10.20

Table 8. Meat, chicken and fresh fish consumption frequencies at home (expressed as percentage of respondents) (source: Anonymous, 1996a)

	Meat	Chicken	Fish
Every day	18.9	1.1	0.8
Once every two days	11.5	4.9	2.1
Twice a week	10.8	9.6	5.8
Once a week	20.6	28.1	29.8
Once a fortnight	11.5	21.8	18.6
Monthly	17.6	25.5	25.7
Three/four times a year	7.8	8.3	16.6
None	1.2	0.8	0.7
Base	2164	2164	2164

Table 9. Consumption of fish by Turkish households in 1994 (source: Anonymous, 1996a)

Species	Consumption (kg)
Anchovy	13.87
Horse mackerel	3.54
Trout	2.40
Whiting	1.32
Grey mullet	1.02
Bonito	0.92
Sea bass	0.67
Sea bream	0.41
Blue fish	0.41
Sardine	0.40
Red mullet	0.22
Others	3.69

Variations in consumption and preferences between regions

Anchovy enjoys the advantage of being the most popular fresh fish among all regions. Bonito follows anchovy in Marmara, Aegean and Central Anatolia regions. Trout, grey mullet and sea bass were found to be very popular in the Mediterranean region. In the Black sea region whiting is as appreciated as anchovy. In Eastern Turkey trout is the most favourite fish after anchovy. Black sea and Mediterranean regions seem to distinctive in terms of their fish consumption patterns, consumption being confined to locally available species (anchovy and whiting in the Black sea and pilchard and bonito in the Mediterranean). The Marmara and Aegean regions are the leading areas as far as level and variety of fish consumption are concerned. Coastal areas posses higher consumption and greater variety of choice due to proximity and availability of choice. In inland areas including Central and South Eastern Anatolia, both level of consumption and variety of fish consumed decrease, with anchovy, carp and mullet (inci kefali, a local species from lake of Van) being the most popular species (Table 11).

Table 10. Awareness, preference and consumption scores for 12 key species (Anonymous, 1996a). Numbers in brackets refer to rank of preference

Species	Fresh fish species known (un-prompted) (%)	Species if fresh fish ever eaten (prompted) (%)	Fresh fish bought in the last 12 months (%)	Most recent purchase (%)	Fresh fish species preferred (%)	Fresh fish species preferred by children (%)
Anchovy	91.0 (1)	89.3 (1)	81.2 (1)	53.0 (1)	58.1 (1)	46.1 (1)
Horse mackerel	48.3 (2)	51.7 (2)	33.7 (2)	13.6 (2)	12.4 (4)	8.0 (4)
Bonito	40.1 (3)	48.0 (3)	26.6 (3)	7.2 (4)	17.7 (3)	11.6 (3)
Trout	28.2 (4)	43.5 (4)	23.4 (4)	6.0 (7)	18.5 (2)	12.3 (2)
Whiting	22.9 (6)	31.0 (6)	19.4 (5)	9.0 (3)	12.0 (5)	7.7 (5)
Blue fish†	29.8 (5)	34.1 (5)	17.1 (6)	6.6 (6)	11.2 (6)	6.7 (6)
Sardine	15.0 (10)	25.6 (10)	14.8 (7)	7.0 (5)	6.2 (10)	3.6 (11)
Grey mullet	18.6 (8)	30.9 (8)	14.7 (8)	5.7 (8)	7.2 (8)	5.2 (7)
Red mullet	16.9 (9)	26.4 (9)	14.1 (9)	4.5 (9)	8.7 (7)	4.7 (8)
Mackerel	19.2 (7)	32.2 (7)	13.6 (10)	3.6 (10)	6.4 (9)	2.5 (12)
Sea bass	11.4 (11)	20.7 (11)	8.9 (11)	2.8 (11)	5.4 (11)	3.4 (10)
Sea bream	11.0 (12)	16.7 (12)	7.7 (12)	3.6 (10)	3.9 (14) ††	2.3 (14) †††

†Total of all bluefish types.
††Carp (6.1%) and turbot (4.6%) take ranks 12 and 13.
†††Carp (4.6%) and turbot (2.6%) take ranks 9 and 13.

In rural areas fish consumption expenditure are mainly composed of anchovy, horse mackerel and cheap freshwater species like carp. Though the above mentioned species are also consumed in urban areas, the bulk of fish consumption expenditure in urban areas is composed of more expensive species like bluefish, red mullet and sea bream. Semi urban areas consumption patterns are more or less similar to urban areas (Table 12) (Anonymous, 1996a).

Variation in fish consumption by different income groups

The variation in fish consumption patterns by different income groups in Turkey (household income) are presented in Table 13.

Consumers attitude towards fish and consumption habits

Attitude of Turkish consumers towards fish consumption is summarized in Table 14.

Generally Turkish consumers prefer fresh fish. However, the results of survey carried out by Saygı and Şengör (1997) indicates that this habit is changing, and consumption of processed fish products is increasing. Frozen products seem to be the most popular among processed items (Table 15).

Table 11. Variation in fish consumption and preference between regions (source: Anonymous, 1996a)

	Marmara-Aegean	Central Anatolia	Mediterranean	Black Sea	South Eastern Anatolia	Eastern Anatolia
High consumption	Red mullet Sea bream Turbot H. mackerel Bluefish Sardine Bonito Mackerel	Anchovy	Carp Trout Red mullet Mullet Sea bream Sea bass	Anchovy Red mullet Bonito Turbot Whiting	Anchovy	Anchovy Carp
Average consumption	Anchovy Sea bass Mullet Whiting	Mackerel H. mackerel Trout Bonito Carp	Turbot	H. mackerel		Trout H. mackerel
Low consumption	Carp	Sardine Turbot Sea bass Sea bream Red mullet Mullet Whiting Bluefish	Anchovy Bonito Sardine Whiting Bluefish Mackerel H. mackerel	Trout Sea bream Mullet Sea bass Bluefish Sardine Mackerel Caro	All other species	All other Species

Table 12. The patterns of fish consumption in rural/urban areas (source: Anonymous, 1996a)

	Urban	Semi-urban	Rural
High consumption	Red mullet Sea bream Mackerel Horse mackerel Sardine Turbot Striped bream Bonito Bluefish	Bonito Anchovy Carp Trout Horse mackerel	Anchovy
Average consumption	Trout Sea bass Whiting Carp	Bluefish Red mullet Mullet Sea bream Turbot Mackerel Sardine	Carp Trout Whiting Sea bass
Low consumption	Anchovy	Whiting Sea bass	All others species

Table 13. Fish consumption by different household income groups[†] (Anonymous, 1996a)

	High consumption	Average consumption	Low consumption
Trout		HI,AI,LI	
Red mullet	HI	AI	LI
Sea bream	HI	AI	LI
Anchovy	LI	AI	HI
Horse mackerel	AI	HI	LI
Mullet	HI	AI	LI
Sea bass	HI	-	AI,LI
Bluefish	HI	AI	LI
Whiting	LI	AI,HI	-
Bonito	HI,AI	-	LI
Sardine	-	HI,AI,LI	-
Mackerel	AI	HI	LI

[†]HI: high income; AI: average income; LI: low income.

Table 14. Consumers attitude towards fish (%) (source: Anonymous, 1996a)

	Agree	Neither agree nor disagree	Disagree	Do not know
I like trying new species	56.8	8.4	30.9	3.9
Difficult to eat	70.0	6.6	22.7	0.7
Would consume more if it was cheaper	79.6	5.5	14.1	0.8
Male prefer red meat to fish	49.3	12.7	31.6	6.4
Canned fish as good as fresh fish to you	14.0	7.9	39.2	38.9
Marine fish is more delicious than freshwater fish	63.8	8.7	17.5	10.0
Fish consumption is good for health	97.7	1.0	0.8	0.5
Smell is the problem in cooking fish	79.7	5.1	14.7	0.5
Children like fish	74.4	12.6	10.4	2.6
Prefer to offer fish to my guests	56.2	14.3	28.0	1.5
Buying fresh fish is really easy	68.4	8.7	18.2	4.7
My family prefers chicken to fish	48.4	16.5	33.8	1.2

Table 15. Sale frequencies of processed fish products in hypermarkets (source: Saygı and Şengür, 1997)

Preferred seafood item	%
Canned fish	32.0
Smoked fish	3.5
Frozen fish	14.3
Frozen cephalopods	10.7
Frozen shellfish	10.7
Fresh fish	25.0
Surimi	3.5
Total	100

Consumers expenditure on food and fish

1994 Turkish households expenditure survey indicate that food expenditures (including liquor and tobacco) constitute 35.62% of total household expenditures (Anonymous, 2000c).

According to 1987 household income and expenditure survey, food constitutes 32.0% of total household expenditure. This figure was 27.0% for urban and 41.0% for rural areas. Fish was found to account only for a small portion of food expenditures (Table 16).

Table 16. Share of different food items in food expenditure of Turkish households (source: Anonymous, 1996a)

Food item	Budget share (%)
Fish	1.1
Bread	9.2
Cereals	9.2
Meat	15.7
Poultry	1.8
Milk and dairy products	10.3
Eggs	2.3
Animal fats	2.0
Vegetable oil	5.3
Pulses	4.3
Others	38.8

Characteristics of distribution system and channels

Wholesales (first hand sales)

The coastal regions of Turkey are generally well-equipped with harbours and landings where fish can be brought to shore. Good road access to these harbours and landings allows fish to be handled at any convenient point and transported to the most profitable markets by truck (Anonymous, 1996a).

Wholesales constitute 70-80% of the marine fish sales in Turkey. The primary wholesale markets are located in Istanbul, Izmir, Trabzon and Samsun. Istanbul and Izmir wholesale markets are the largest in terms of volume of trade. Ankara handels both primary and secondary wholesale trade. The wholesale markets are managed by local municipality.

The share of fisheries co-operatives in overall trade of marine fish is not significant. In 1997 the overall share of co-operative was only 4.0% (Fig. 27). Aquaculture products follow the same pattern as in the case of capture fisheries products. Farmers or commissioners transport the fish (boxed and iced) to major markets such as Istanbul, Izmir and Ankara. Packing is much better than for captured fish. Farmers may have contracts with particular wholesalers or deal directly with retailers (Anonymous, 1996a).

A schematic view of aquatic products distribution chain in Turkey is presented in Fig. 28.

Retail outlets

Fish bazaars (markets) and mobile (travelling) sellers are two important retail outlets in Turkey. Three other less significant outlets are local bazaars, specialist fish shops and direct sales from fishers. The share of supermarkets (hypermarkets) in aquatic products trade was found to be 0.5% in 1995 (Table 17). Nevertheless, it should be pointed out that the share of hypermarkets in overall Turkish retailing market is increasing in the recent years. The value of Turkish retailing market is estimated as 40 billion US$, and along with many national companies many international supermarket chains (Metro, Continent, Champions, Carrefour) have already entered Turkish retail market. Most of these supermarkets have seafood departments and are engaged in sea food sales. Therefore, the

new trend is developing in favour of supermarket chains in the metropolises. Survey carried out by Albayrak (2000) indicate that the main retail outlets for meat in Ankara are supermarkets (66.0%) and butchers (23.5%).

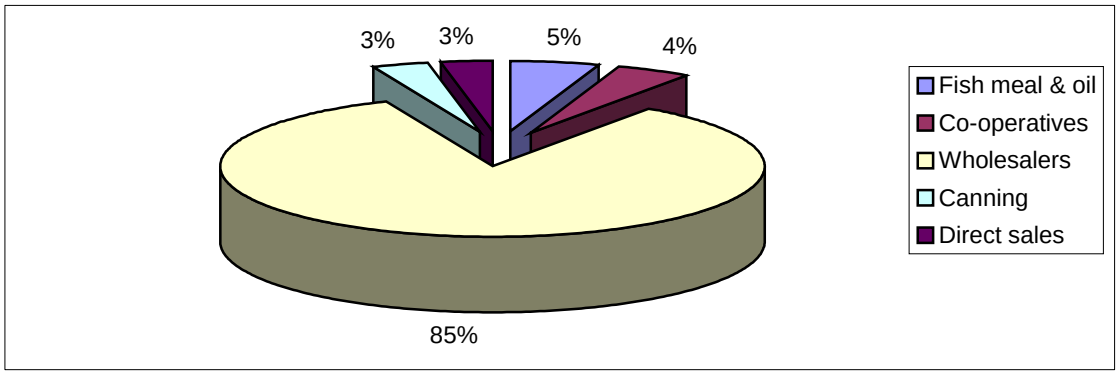

Fig. 27. Shares of different first hand sale channels for marine fisheries in 1997 (based on data from Anonymous, 1998a)

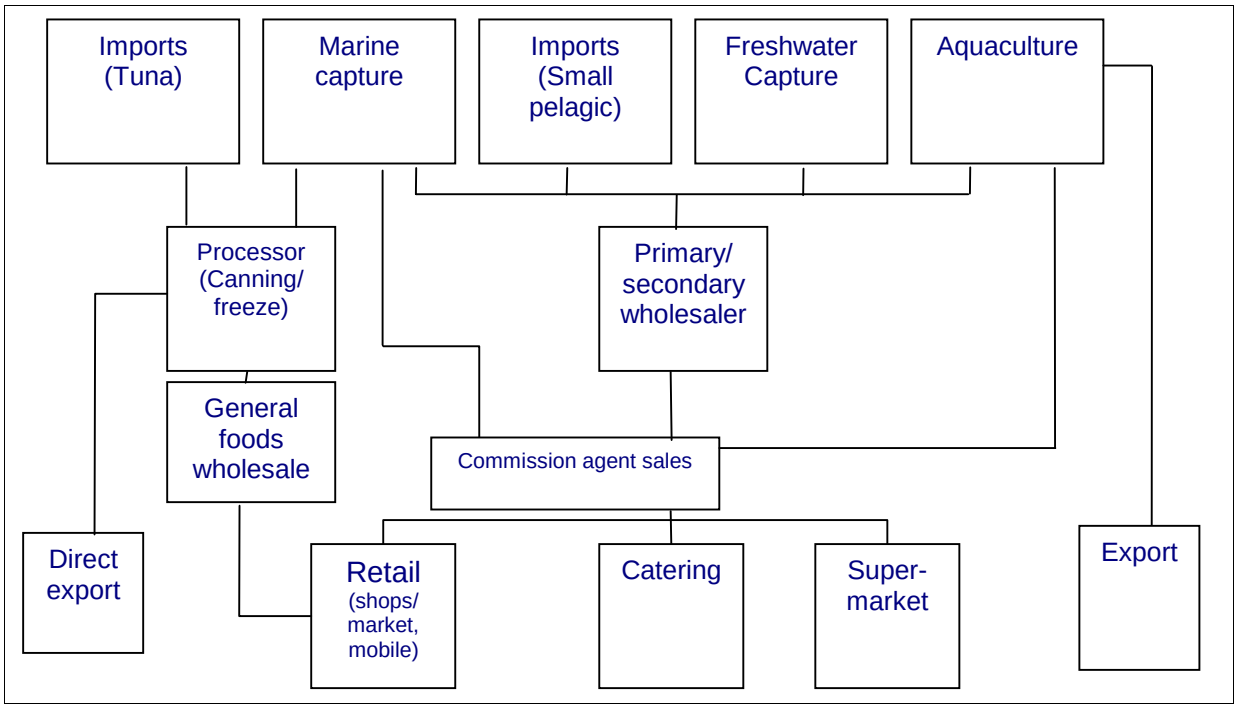

Fig. 28. Distribution chain for fisheries and aquaculture products in Turkey (Anonymous, 1996a)

Catering sector

The data presented below on catering service are the findings of a survey carried out in 1995 covering 200 catering points in Turkey (Anonymous, 1996a).

63.0% of catering points (hotel, tourist restaurants) covered by the survey were found to serve fresh fish regularly. 26.5% served smoked fish regularly while, 21.0% regularly served frozen and 18.5% served canned fish. The total consumption of aquatic products by catering sector in Turkey in 1995 was estimated 9200 t (Anonymous, 1996a). The shares of aquatic products served regularly or irregularly are given in Table 18.

Table 17. Retail outlets for aquatic products (percentage of purchases) (source: Anonymous, 1996a)

	Total	Urban	Semi-urban	Rural
Fish market/bazaar	34.0	48.3	32.0	24.2
General market/bazaar	0.8	1.7	0.3	0.4
Fish shops	9.4	13.6	11.8	5.0
Supermarkets	0.5	1.2	0.2	0.2
Fishermen	8.5	7.5	6.9	10.0
Mobile sellers	31.5	15.0	25.7	47.0
Local market/bazaar	9.9	9.5	16.6	7.0
Others	5.4	3.2	5.3	6.2

Table 18. The shares of aquatic products served by catering sector (source: Anonymous, 1996a)

	Hotel and tourist restaurants	Other catering points
Fresh fish	93.7%	93.5%
Frozen fish	58.4%	39.5%
Canned fish	43.2%	27.5%
Smoked fish	64.2%	43.0%

Species most favoured by customers and served regularly by catering sector were: bluefish, sea bass, sea bream, turbot, bonito, shrimp, anchovy, cuttlefish, painted comber, red mullet, sole, whiting, trout and striped bream (Anonymous, 1996a).

Economic and demographic data

Table 19 presents the main economic indicators of Turkey.

Table 19. Main economic indicators (source: Anonymous 2000a; Anonymous, 1999)

	1996	1997	1998	1999
Population (1997 census and estimates)	61,536,000	62,865,000	63,451,000	64,385,000
GNP (in billion US$)	183.6	192.3	204.6	–
Distribution of GDP (%)				
Agriculture (inc. fish.)	16.8	14.5	17.5	
Industry	25.0	25.2	23.0	
Construction	5.8	6.0	6.0	
Services	49.0	50.8	50.6	
Per capita income (in US$)	2984	3076	3255	–
Foreign trade balance (million US$)				
Balance	-20,402	-22,297	-19,947	-12,189†
Imports	43,626	48,558	45,921	35,983†
Exports	23,224	26,261	26,973	23,703†
International reserves (million US$)	25,007	27,168	29,506	38,497
Number of incoming tourists	8,530,978	9,712,510	9,431,280	7,485,308††

†Data of 11 months.
††Data of 10 months.

Demographic data

According to the last census in 1997 Turkish population was 62,865,000, 65.0% living in urban and the remaining 35.0% in rural areas. Population is quite young and 53.3% of the population is aged below 25 years old (Anonymous, 1996a).

Breakdown of Turkish households (1994 census) are given in Table 20.

Table 20. Breakdown of Turkish households (number and distribution, %) (1994) (source: Anonymous, 1996a; Anonymous, 2000c)

	Total	Urban	Rural
No. of households	13,342,055 (100.0%)	7,487,766 (56.0%)	5,854,289 (44.0%)
1 Person	1.8%	2.1%	1.4%
2 Persons	11.4%	11.8%	11.1%
3 Persons	16.8%	18.8%	14.1%
4 Persons and above	70.0%	67.3%	73.4%

References

Albayrak, M. (2000). *Ankara ilinde gıda maddeleri paketleme ve etiketleme bilgileri hakkında tüketilerin bilinç düzeyinin ölçülmesi, gıda maddleri alım yerleri ve ambalaj tercihleri üzerine bir araştırma*. Türkiye Ziraat Odaları Birliği, Ankara.

Akman, K.A. (2000). *Türkiye'de beyaz et ve yumurta üretimi, iç tüketim ve dış satım sorunları ve önerileri*. Türkiye-2000 Hayvancılık Kngresi, Anakara Ticaret Odası, 31 Mart-02 Nisan 2000, Ankara.

Anonymous (1989). *1988 Fisheries statistics*. SIS, Ankara.

Anonymous (1990). *1989 Fisheries statistics*. SIS, Ankara.

Anonymous (1991). *1990 Fisheries statistics.* SIS, Ankara.

Anonymous (1992). *1991 Fisheries statistics*. SIS, Ankara.

Anonymous (1993). *1992 Fisheries statistics*. SIS, Ankara.

Anonymous (1994a). *Inland waterbodies and fishfarms. Final report.* Ministry of Agriculture and Rural Affairs(Cofrepeche-Gersar Brl), Ankara.

Anonymous (1994b). *1993 Fisheries statistics*. SIS, Ankara.

Anonymous (1995). *1994 Fisheries statistics*. SIS, Ankara.

Anonymous (1996a). *Türk Su ürünlerinin mevcut iç ve dış pazarları ile gelecekteki Pazar olanakları üzerine bir çaılşma*. Tarım ve Köyişleri Bkanlığı (Macalister Elliott and Partners Ltd.), Ankara.

Anonymous (1996b). *1995 Fisheries statistics*. SIS, Ankara.

Anonymous (1997). *1996 Fisheries statistics*. SIS, Ankara.

Anonymous (1998a). *1997 Fisheries statistics*. SIS, Ankara.

Anonymous (1998b). *Zirai ve iktisadi rapor*. Türkiye Ziraat Odaları Birliği, Ankara.

Anonymous (1999). *Monthly Bulletin of Statistics*. SIS, Ankara.

Anonymous (2000a). *Main economic indicators*. http/www.turkey.org/business/b_mainindi.htm (20.08.2000).

Anonymous (2000b). *Turkish economy and economic policies open to foreign competition*. http/www.mfa.gov.tr/grupd/df/01.htm (20.08.2000).

Anonymous (2000c). *Hanehalkıtüketm harcaması anket sonuçları*. http/www.die.gov.tr/Turkish/Sonist/Hhgeltuk/gt/tab1.gif (21.08.2000).

Babadoğan, G. (1998). *Su ürünleri sector araştırması*. İhracatı Geliştirme Etüd Merkezi, Ankara.

Elbek, A.G., Emiroğlu, D. and Saygı, H. (1999). *İzmir ilinde su ürünleri tüketimi*. Ege Üniv. Su Ürünleri Fak. Yayın no.57, İzmir.

Emre, Y. and Kürüm, V. (1998). *Alablık yetiştiriciliği*. Minpa Matbacılık, Ankara.

Rad, F and Köksal, G. (1998). An overview of aquaclture in Turkey: With emphasis on sea bass and sea bream. *Journal of Aquaculture Economics and Management* (in press).

Rad, F. (1999). *Türkiye'de Gökkuşağı alabalığı işletmelerinin biyo-teknik ve ekonomik analizi*. Doktora Tezi. Anakara Üniversitesi, Fen Bilimleri Enstitüsü, Ankara.

Rad, F. (2000). Species diversification in Turkish aquaculture sector. *Eurofish Magazine* June3/2000.
Saygı, H. and Şengör, G.F. (1997). *Ege bölgesi su ürünleri sanayi işletmelerinin aktiviteleri ve tüketici tercihleri*. Ege Üni. Su Ürünleri Fakültesi Gergisi. Cilt 14, Sayı 3-4, İzmir.
Şenel, G., Atik, F., Bayrak, M., Taşer, B., Kuşhan, S., Saygın, Ş. and Deveci, S. (2000). *Su ürünleri ekonomisi*. DPT, Ankara.