Farming of the Rainbow Trout, *Oncorhynchus mykiss,* in the Black Sea Region of Turkey

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Abstract

The peculiar structural properties of Black Sea have adversely fisheries as a result of dense pollution. However the permanent association Black Sea People with sea and fishes has reached a new dimension with the begin of aquacultural experiments in Turkey.

Key Words: rainbow trout, trout aquaculture, Black Sea Region

Introduction

The Black Sea is an inland sea that has only 8% of the area in waters shallower than 150-200 m. The North Anatolian mountain range rises as a wall along the coast. The Black Sea Region has contributed about 70% to the total fish production of Turkey for many years (Anon., 1996; Okumuş *et al*., 1997). But the decline in fishing and suitable fishing areas have led to the rise of aquaculture beginning with rainbow trout *Oncorhynchus mykiss* in 1971. Aquaculture is now one of the most rapidly developing sectors in the food industry and has been greatly influenced by global developments. In the 1980s, farming of Atlantic salmon *Salmo salar* began along the Black Sea; however, it was not successful because the surface water temperature of 20ºC during the summer is marginal for salmon culture.

Rainbow trout aquaculture still has great potential for further development in both fresh and marine waters (Soylu and Soylu, 1997; Okumuş *et al*., 1997; Şahin *et al*., 1999). The Black Sea coast from the east of Sinop to Gerze is relatively flat and in the Çarşamba delta, some sites are useful for rainbow trout farming in net cages (İzbırak, 1996; Atalay and Mortan, 1997). Recent research on the structure of fish farms in the Black Sea Region has shown 10.9% greater productivity of farms in the sea than on land, but that there are important marketing problems (Zengin and Tabak, 1997).

This paper describes the development, recent improvements, and future trends in rainbow trout aquaculture in the Black Sea Region.

Materials and Methods

Rainbow trout farms in the east and middle part of Black Sea coast were selected for this study. These farms differed in capacity and conditions. A questionnaire with more than 100 questions was used to determine the main factors affecting rainbow trout farming. Environmental parameters were measured periodically in each farm over a period of more than one year from May 1998 to June 1999 (Elbek, 1981; Soylu and Soylu, 1997). Production trends were analysed.

Results and Discussion

A large part of the world's rainbow trout production (262,100 mt in 1990) is supplied by European countries and the USA. Rainbow trout is consumed mostly in local markets and Denmark is the most important export market (Chamberlain, 1993). The total rainbow trout aquaculture production in Turkey is 28,500 mt (1997) and the Black Sea Region provides of 13,875 mt of this. Consumption of rainbow trout in Turkey ranks third after anchovy *Engraulis encrosicholus* and horse mackerel *Trachurus trachurus* and will probably increase in the future.

In rainbow trout aquaculture, the water must be of good quality and in sufficient quantity. An important factor affecting rainbow trout aquaculture in the Black Sea is the water temperature (Zengin and Tabak, 1997). The ideal temperature is 15-18ºC for grow-out and 10-12ºC for hatchery (Billard, 1990).

The aquaculture realised both inland waters and in the sea with net cages is effected in negatively by unadequate water temperature Rainbow trout aquaculture can still be intensified.

There are more than 300 rainbow trout farms with different production capacities in the Black Sea Region. The problems of small-scale family-type farms are similar to each other. It would be advantageous for these farms to cooperate and to unite under a single roof to overcome these problems.

The aquaculture industry in Turkey is integrated

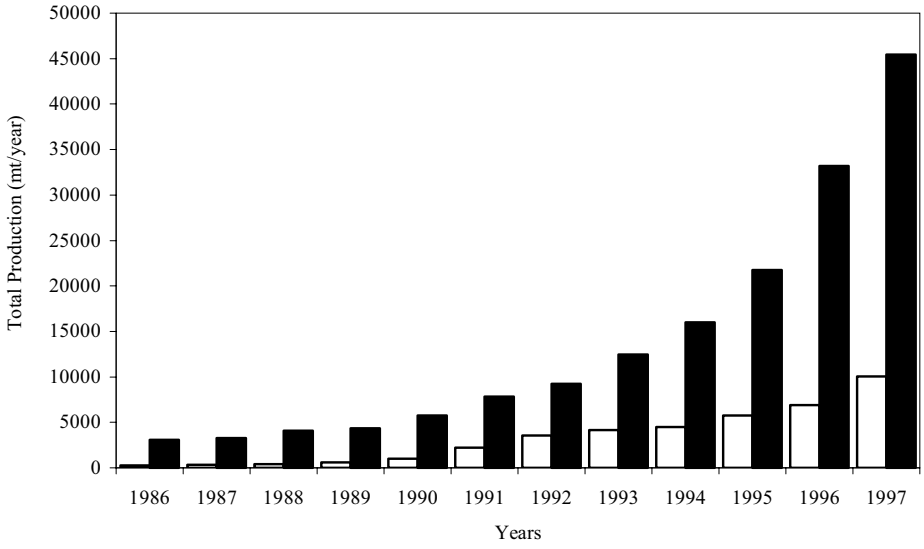

Figure 1. Total aquaculture production in Turkey and the Black Sea Region, 1986-1997.

Table 1. Farming system and production in rainbow trout farms in the Black Sea Region.

Farming system	Farms	Total production (mt/year)
Marine net cages	4	417,500
Land ponds	11	425,815
Land and marine farm	2	205,187
Dam lake net cages	1	250,000
Land and dam lake farm	1	512,500
TOTAL	19	1,811,002

Table 2. Production of rainbow trout farms in the Black Sea Region in 1999.

Cities	Total farms	Farms studied	Total production in farms studied (mt)
Bayburt	3	1	10.1
Trabzon	26	4	256.2
Samsun	9	2	762.5
Rize	17	4	220.7
Giresun	49	5	148.9
Ordu	19	3	412.6
TOTAL	129	19	1,837.3

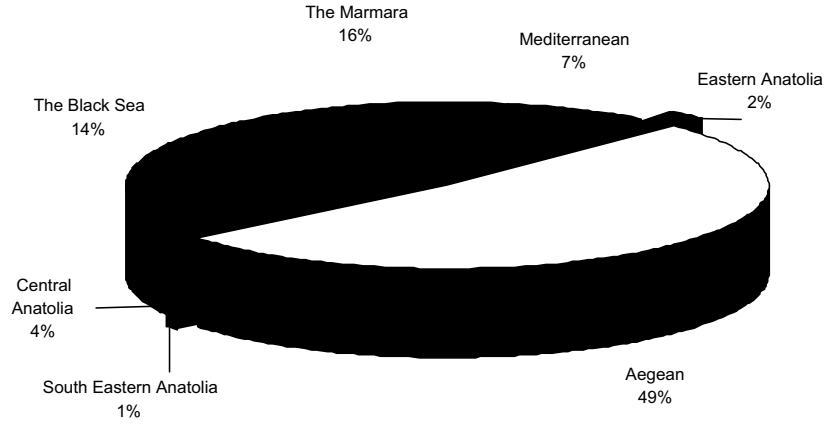

Figure 2. Turkish aquaculture production by region.

with the feed industry, drug industry, machinery and equipment manufacturing industry, marketing, tourism, and the food industry. Aquaculture development is fully supported by government and the much scientific effort in universities is devoted to the identification of suitable species, sites, and system criteria for aquaculture production areas (Şener and Yıldız, 1997).

Table 3. Regional aquaculture production in Turkey in 1996 (Anon., 1996).

Region	Production (mt)
The Black Sea	6,290
The Marmara	5,251
Aegean	16,290
Mediterranean	2,265
Central Anatolia	2,065
Eastern Anatolia	615
South Eastern Anatolia	425
TOTAL	33,201

Table 4. Environmental conditions for rainbow trout *Oncorhynchus mykiss* aquaculture in the Black Sea Region.

Farming system	Water temperature (°C)	Oxygen (mg/l)	pH	Rearing time to market size (months)
Land ponds	1-18	8-15	6.5-8.5	10-20
Marine net cages	5-29	10-11	7.0-8.5	10
Dam lake net cages	5-25	4-10	7.5-8.5	12

Table 5. Rainbow trout aquaculture in the Black Sea Region (Anon., 1996; Şener *et al.*, 1999).

Years	No. rainbow trout farms	Total production (mt)
1973	1	60
1983	10	121
1993	136	4,122
1997	240	6,437
1998	270	10,600
1999	300	13,875

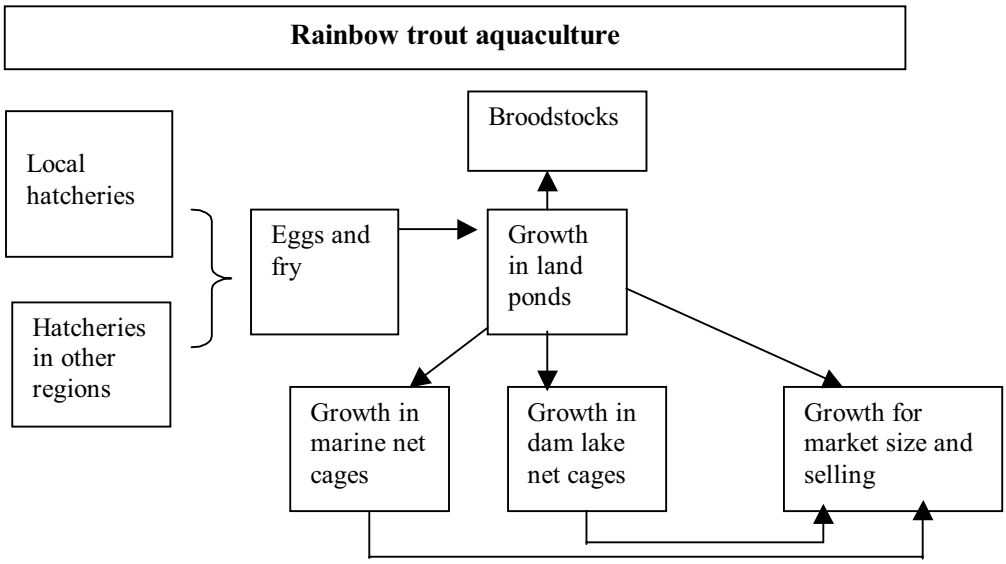

Figure 3. Schematic of rainbow trout aquaculture in the Black Sea Region.

When Turkey joined the European Union, agriculture and animal production industries received attention for various reasons. Rainbow trout aquaculture has received much attention in Turkey. The potential advantages and plans for modern aquaculture will stimulate the growth of the industry into the 21st century.

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