

OBSERVATION of GROWING PROPERTIES (in CAGES and PONDS) of TURBOT (*Psetta maxima*) in the BLACK SEA REGION

Nilgün AKSUNGUR – CFRI, Fisheries Engineer

Turbot (*Psetta maxima*), which spreads along from Norway and Atlantic coasts of Europe to the Mediterranean and the Black Sea, has been a target species in production in many countries. The studies on Turbot have focused on larval period, which is the most sensitive period of the production. However, there are some other studies that include rearing period.



One of the most significant problems we faced during the production of Atlantic Turbot is that we reached to the normal turbot weight, which was 2-3 kg, in longer than three years. Hence, much smaller market sizes are aimed. In this study, growth rate, survival and food utilization of the young turbot produced in institute's hatchery until the size of marketing time (≈ 1 kg) were studied in the tank and cage units and the possibilities for the production with the most suitable care and feeding techniques under the regional conditions (sea water temperature 8-31 °C; salinity 16-18 psu) were determined. In this way, before spreading through the private enterprise we have achieved some findings about probable problems and their solutions.

The first experiences on turbot rearing back to the beginning of the 20. Century when obtained eggs and larvae. Only in the 70's British and French researchers took it up again. Until the 80's the rearing of turbot was not introduced in Spain, experiences were gathered on growing by researchers.

Development of hatchery technologies for the Black sea turbot was started in 1990 at the Russia and Ukraine. The ultimate objective of the hatchery is to make possible the regular release of juvenile turbot to the sea to increase the stocks and thereby sustain the turbot fishery in the Black Sea.

In Turkey since April 1997 a collaborative project between Japan International Cooperation Agency (JICA) and Ministry of Agriculture and Rural Affairs, Central Fisheries Research Institute in Trabzon have been started for the sustainable seed production of Black sea turbot.

With the project, successful results were obtained on technical subjects.

STUDIES of PROJECT

This study, which is extension of "The Fish Culture Development Project in The Black Sea", has been started in 1997 and cooperated with JICA. In this study, the growth, survival and food conversion rates of the juvenile turbot reared in the hatchery of institute were examined using the sea cages and fibreglass (FRP) tanks until marketable size (about 1 kg) in ambient conditions, temperature 8-31°C, salinity 16-18psu, and the most suitable rearing technique was investigated. Thus, before rearing technique is transferred to private sector, problems that can be encountered during growing period and probable solutions were obtained.

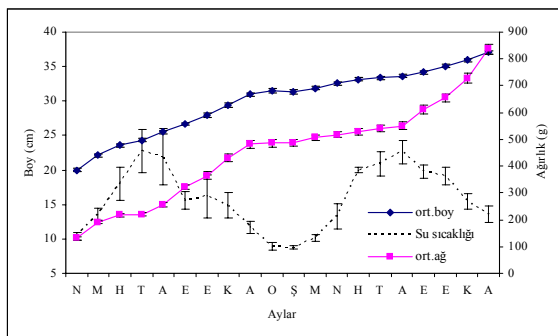
During this study five trails were carried out in order to get sufficient data related growing of Turbot in the Black Sea condition. Firstly cage models were tested to determine suitable cage considering biological demands of Turbot by using 3000 ind. with average length of 10 cm. After that, the stock density trail including four groups consist of 30, 60, 90 and 120 individuals for each group was set on cover 8 months in Yomra Fisherman Shelter. At the end of trail there were not statistical difference ($P > 0.01$) among 30, 60 and 90 groups, except 120 individuals group ($P < 0.05$).

Third trail was the growing in the tanks within water was cooler than surface and derived from 27 m depth. The trail was started on April 2001 with average 19.9±0.22 cm length and 130.2±5.21 g weight. After 22 months, fish were reached average 37.1±0.24 cm total length and 836.5±17.33 g weight at the end of trail.

In the case of growing in the sea cage trail, fish average 18.15 cm in length and 99.4 g in weight were placed to the sea cage at 50 fish/m² density on 15th February. After 18 months, average total length and body weight of fish were 33.6±0.31cm and 547.6±14.18 g respectively, while in summer season all experimental fish divided in to two groups, half of fish was transferred to tanks for 4 months and the another half of fish was used for survival trail.

The last one is, the survival trail was set on to determine effect of high water temperature on Turbot. The fish that belong to the sea cage trail were suffered from bacterial and parasites agents divided in to two groups on June and one was transferred to tanks within water cooler than surface and derived from 27 m depth and, the another group remind in the sea cage. Although the same treatment applied, the sea cage group completely died when temperature over 30°C.

In experiment area physical and chemical parameters of sea water were measured regularly. Biometric measurements were made on 10 percents of each group by Von Bayer Scale (±1mm) and electronic balancer (±0.1 g). After measurements, the fish were replaced the cages or tanks. The fish were feed on rate 1 percent of biomass with dry pellet.



Figür 1. Water temperature and grow-out.

As a result, food intake was getting lower in both the sea cage and tank according to temperature decrease in winter or increase in summer season and in the cease of sea cage food intake hesitated and fish suffered from

parasites and bacterial infections when temperature over 24°C and it is observed that level of temperature 28-30°C is lethal for Turbot.

Also, the growth of turbot given fish farmers to encourage rearing of this fish was observed. The farmers are in Rize, Ordu, Çanakkale and Muğla (Milas).



RESULTS and ADVICES

One of the most important problems in grow out stage of turbot is that the period spent until reaching the size of marketing time is too long. With the help of a good feeding regime as well as optimal temperature regimes and oxygen saturation provided by ventilation, an improvement can be achieved in the rearing of turbot. By making the content of the commercial feed productive, the meat quality of the fish can be improved significantly. On the other hand, the selection of turbot which grow up rapidly and those which reach to maturity within the genus at a low level is another way to make turbot ripe enough for the size of marketing time. The ongoing literature studies suggest applications to be carried out in this way. In our project, we have not done any other selection except for the deformed and improperly coloured fish among the matured turbot that were obtained from the nature.

Turbot are reared approximately in 28-30 months until the size of marketing time under the Eastern Black sea conditions. However, especially during the summer months, extremely high water temperatures exceed lethal limits; likewise, low water temperatures during the winter months affect growth rate in a negative way. While the affects of the high

temperature of summer months is eliminated by draining the cold water under the termokline layer (It is also practised in our institution), it is hard to heat the water in winter. European countries prefer closed circuit systems which are set up on land and provide the water of good quality with optimal conditions for the production of turbot. In many countries dealing with the production of turbot (France, England, Chile), sophisticated closed circuit systems have decreased the dependence of the farms to the temperature. Although closed circuit systems require high investment and energy cost, they provide high stock intensity as well as shortening the feeding extension; they do not have any negative affects on the meat quality and the health of the fish itself.

Though they are not used very common in countries that deal with the production of turbot, in the studies we carry out in the floating net cages. Thus, we have witnessed that mainly the water temperature had some negative affects. We need some cages of special design appropriate to the needs of the fish. In addition, we have to form harbour in order to prevent the fish from direct sunlight. The rearing of turbot is only possible in the seasons in which there are not lethal threats like in the case of trout. It is not possible to keep the fish in cages during the whole year under natural conditions.

In production of turbot in European countries, after being fed to a weight of 10 g in

hatcheries, turbot are subjected to a pre-feeding programme in closed systems, for they need water of good quality. Also, in the applications that will be carried out in our country, it can be recommended that the fish be subjected to a pre-feeding programme in the systems aided with heating techniques. If we consider that the hatchery emerging times synchronize with the beginning of the winter when the temperature tends to be decreasing. By this way, the negative affects of the low temperature on the growth rate of the fish can be prevented for 3-4 months. As a result of this, the time spent until the size of marketing time will be shortened.

Both in the pre-feeding programme and other feeding programmes, precautions must be taken against the harmful parasites besides bacterial infections if ultraviolet sterilization systems are not used. Formaldehyde applications must be held against the parasites such as *Trichodina* etc. which we usually come across in our studies at regular intervals. It is informed that formaldehyde bath is applied regularly in turbot farms once a month especially in France. Moreover, rules for hygiene must be obeyed so as not to confront with any diseases.

Some special researchers are needed concerning the economic analysis of the production of turbots, for there are not any studies done about it before.

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On 12-14 March 2003, Prof. Dr. İbrahim OKUMUŞ of Karadeniz Technical University (KTU), Faculty of Marine Sciences, gave a seminar on "Genetics and Rehabilitation Methods".

Under the Project Meeting Program held in Trabzon on 29 April 2003, Mr. Yılmaz YAZAR, Director of Aquaculture Section of GDAR, gave a seminar on "Application of Research Master Plan".

On 25 Sept. 2003, a seminar, namely "Research Administration Seminar" was organized by Erhan BİLGE, Head of Livestock Breeding, and Mustafa ÇETİNDAG of GDAR.

Another seminar was given by Ass. Prof. Hamdi ÖĞÜT, Marine Science Faculty of KTU, under the topic of "Epidemiology of Fish Diseases" on 29 Sept. 2003.

Periodical meetings of Information Exchange are organized by Agriculture Directorates to disseminate the results of agricultural researches and new technologies to farmers. The first meeting of 2003 was held in Rize on 27 March, the second was in Artvin on 19 July, and the third one was in Giresun on 20 Oct. Representatives of Directorates of Farmer Training Department and local institutes participated to these meetings and activities were evaluated and knowledge were shared on research and application issues.
