EFFECT OF TEMPERATURE IN EARLY GROWTH OF TURBOT
(Scophthalmus maximus L.) FROM 0.1 to 500 g.

Martínez-Tapia C. 
and
Fernández-Pato C.A.

Instituto Español de Oceanografía 
C. Oceanográfico de Santander. P.O.Box 240. 
Santander, Spain

ABSTRACT.

Two different groups of turbot were submitted to two different temperatures during a period of time; one at 19°C ± 1°C and the other at the environmental temperature: 14°C ± 1°C.

The two groups are compared at the end of the period of temperature manipulation resulting significant differences in weight (p<0.05) for the group reared at the stable temperature. At the end of the experiment a repetition now the same degree of difference in weight.

INTRODUCTION.

One of the environmental parameters which most influences fish growth is temperature; growth is directly related to the quantity of food, the fish metabolism, and temperature (Brett, 1978).

All of the fish in the juvenile stages show a rapid increase in growth rate through an increase in temperature, but after passing a certain limit this rate decreases quickly (McCormick et al. 1972), and could even become lethal, as happens in the case of brook trout (Salvelinus fontinalis).

Determining the correct temperature to provide optimal growth has become fundamental in aquaculture and many recent studies have been made in this area (Elliot 1979; Jobling 1983).
There are species for which temperature variations seem to have no effect on growth, as happens in the case of brown trout (Salmo trutta) (Elliot 1979).

The objective of this work is to verify that in turbot of 0.1 grammes, fed "ad libitum", with an increase in water temperature, growth rates are improved, obtaining in this a way that the time employed in fattening before their going onto the market is reduced.

MATERIAL AND METHODS.-

The fish used for this experiment, coming from hatchery, were homogenously and randomly distributed in two experimental groups (average weight of group A was 0.13 g. and of group B 0.12 g.).

The two experimental groups were submitted to the same culture conditions except for the water temperature; group A had a stable temperature of 19°C ± 1°C, during five weeks, and group B was subject to environmental temperature (14 ± 1°C). In the first case, by heat-interchangers, the water was heated and, before entering the culture tank, passed through an RBF (Rolling Biological Filter).

The tanks had a 1 m3 capacity and water renovation was at the rate of 0.8 l./min./kg. with illumination of 200 lux in periods of 14/10 hours light/dark.

Oxygen saturation was maintained above 80%, supplementary oxygen being introduced when the level fell below this level.

The temperature and oxygen levels were registered daily.

The fish were fed "ad libitum" twice a day, and sampled three times a month during the period of higher temperature and once a month during the rest of the experiment.
RESULTS.

During the experimental period the temperatures were 19 ± 1°C and 14 ± 1°C for groups A and B respectively.

Specific growth ranged from 17.5% to 2.3% for group A during the period of water temperature manipulation; for group B during the same period specific growth varied from 11.1% to 1.9% (See Table 1 and Figure 1).

<table>
<thead>
<tr>
<th>SPECIFIC GROWTH</th>
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<tbody>
<tr>
<td>GROUP A</td>
<td>GROUP B</td>
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<tr>
<td>17.50</td>
<td>11.10</td>
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<td>6.06</td>
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<td>4.01</td>
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<tr>
<td>2.39</td>
<td>1.90</td>
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Table 1

The mean weight of the "treated" group tripled with respect to initial weight in only two weeks while the biomass of the group subject to environmental temperature variations only doubled.

The individual weight gained was 9.2% daily for the treated groups, against 5.02% for the untreated groups.

The weight comparisons between the groups after applying the t-Student test showed significant differences (p<0.05) for group A; these differences remained throughout treatment until the end of the experiment (Figure 2).

The registered mortality was similar in the two groups at 2%.
DISCUSSION.-

From the results of this experiment it can be confirmed that, unlike other species, the growth of turbot is affected positively when water temperature is increased.

The possibility of achieving the commercial size in the market (Fernandez-Pato et al 1990) before as it should be expected, it has been made clear in this study and could be interesting to the aquaculture industry.

Given that obtaining young fish of this species is already possible at any time of year, fattening can begin from 0.1 grammes using heated water, or when the temperature is more suitable, when seasonal water temperature are warmer for fattening (Santaella, pers. com.), proximate to the temperature that it has been studied.

REFERENCES.-


Fernandez-Pato, C.; Martinez-Tapia, C. and Chereguini, O. 1990.- Growth of Turbot (Scophthalmus maximus) from 1 to 3000g in the north of Spain.- Int. Counc. Exp. Sea. CM/F:29.


COMPARATIVE GROWTH IN WEIGHT
OF TURBOT AT TWO WATER TEMPERATURES

DOUBLE LOGARITHMIC RELATION BETWEEN
SPECIFIC GROWTH AND MEAN WEIGHT

SAME PERIOD OF TIME IN BOTH GRAPHICS

FIGURE 1
COMPARATIVE GROWTH OF THE EXPERIMENTAL GROUPS

POINT SAME TEMPERATURE

ENVIROMENTAL WATER  HOT WATER
COMPARATIVE GROWTH IN WEIGHT OF TURBOT AT TWO WATER TEMPERATURES

- 19 °C
- 14 °C

- WEIGHT
- DAYS * 10

0 2 4 6 8 10 12 14 16 18
Specific growth and mean weight
Double logarithmic relation between

Mean weight