LENGTH-WEIGHT RELATIONSHIP OF JUVENILE SARDINE
SARDINA PILCHARDUS (WALBAUM, 1792)
FROM BOKA KOTORSKA BAY

Vladica Simić**

*Institute of Marine Biology, Dobrota b. b., 85330 Kotor, Serbia and Montenegro
  e-mail: pi098ana@yahoo.com
**Faculty of Science, Radoja Domanovića 12, 34000 Kragujevac,
  Serbia and Montenegro

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ABSTRACT. The length - weight relationship of juvenile sardine Sardina pilchardus
from Boka Kotorska Bay was analyzed. The better knowledge of juvenile growth
needs more attention for the entire Adriatic sea, special for the Montenegrin coast
were this investigation was made for the first time. The results obtained from these
investigations were compared with the data obtained from the period 1986-87 from
the area of Novigrad and Karin Bays of the eastern Adriatic coast [1].

INTRODUCTION

The huge problem in fishing biology is insufficient knowledge of growth and
mortality of juvenile stadiums of fishes. That problem is mostly related to the fishing
technique, because fishing tools are made for catching only the adult part of population.
There is a specific situation on Montenegrin shelf, which enables detail researches of
juvenile sardine, starting from analysing her growth and mortality to the anlyzes of
frequencies of new cohort apearing.

Namely, catch of small pelagic fishes on Montenegrin coast with industrial fishing
techniques in the open sea is still undeveloped. Sardine and anchovy are only caught with
beach seines with using of artificial lights (luring) in coastal waters, especially in Boka
Kotorska Bay. Traditionally, this type of fishery is mostly developed in Kotor Bay.

This special type of fishery is carried out in Boka Kotorska Bay for centuries. First
data of catching the juvenile sardine from the 1331 year could be found in the Kotor town
Archive. Furthermore, the fishery of juvenile sardine is spread all over Mediterranean, especially in Adriatic Sea [2, 3, 4, 5, 6, 7, 8, 9].

MATERIAL AND METHODS

Juvenile sardine were studied in Boka Kotorska Bay. It's a closed marine bay with a lot of freshwater springs emptying into it, and is liable to rather great temperature and salinity variations. Samples of juvenile sardine for this study were collected at least once a month from June 2004 to August 2005. The length and weight of 2489 individuals of *S. pilchardus* were measured. The total weight of analyzed individuals was 11.56 kg.

Total length (TL), from the peak of mandible to the stretched ends of the caudal fin was measured with the one millimetre precision.

Weight of the fishes was measured with precision of 0.01 gram.

RESULTS

Length - weight relationship was approximated with well known power function of the form:

\[ W = aL^b \quad (1), \]

where \( W \) is the weight in grams, \( L \) is total length in centimeters, while \( a \) and \( b \) are constants.

The function (1) was linearized taking the logarithms \( W \) and \( L \):

\[ \log W = \log a + b \log L \quad (2). \]

Equation (2.) was fitted to the data, and constants \( a \) and \( b \) were estimated with method of linear regression, where \( \log L \) was independent and \( \log W \) dependent variable.

Linear regression was estimated from logarithms of average values of the length classes with the intervals of 0.5cm (Tab. 1).

The following results were obtained:

\[ a = -2.3304 \]
\[ b = 3.1671 \]
Table 1 - Logarithmic averages of the length and weight through length intervals in Boka Kotorska Bay

<table>
<thead>
<tr>
<th>Interval midpoint (cm)</th>
<th>log LT</th>
<th>log W</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.745</td>
<td>0.6762</td>
<td>-0.1871</td>
</tr>
<tr>
<td>5.245</td>
<td>0.7197</td>
<td>-0.0469</td>
</tr>
<tr>
<td>5.745</td>
<td>0.7593</td>
<td>0.1249</td>
</tr>
<tr>
<td>6.245</td>
<td>0.7955</td>
<td>0.1962</td>
</tr>
<tr>
<td>6.745</td>
<td>0.8289</td>
<td>0.2969</td>
</tr>
<tr>
<td>7.245</td>
<td>0.86</td>
<td>0.3757</td>
</tr>
<tr>
<td>7.745</td>
<td>0.889</td>
<td>0.4846</td>
</tr>
<tr>
<td>8.245</td>
<td>0.9162</td>
<td>0.5804</td>
</tr>
<tr>
<td>8.745</td>
<td>0.9418</td>
<td>0.6606</td>
</tr>
<tr>
<td>9.245</td>
<td>0.9659</td>
<td>0.7193</td>
</tr>
<tr>
<td>9.745</td>
<td>0.9888</td>
<td>0.7848</td>
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<td>1.0105</td>
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</tr>
<tr>
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<td>0.8864</td>
</tr>
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<td>1.1381</td>
<td>1.3041</td>
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<tr>
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<td></td>
</tr>
<tr>
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<td>1.3906</td>
</tr>
<tr>
<td>15.245</td>
<td>1.1831</td>
<td>1.4094</td>
</tr>
<tr>
<td>15.745</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.245</td>
<td>1.2107</td>
<td>1.5278</td>
</tr>
</tbody>
</table>

Antilogarithm of the coefficient $a$ is:

$$a = 0.0047$$

Standard error of the constant $b$ is $S_b = 0.0256$, and the confidence limits for 95% probability levels are from 3.0925 to 3.2416. $F$ value is 7845.9, and for $F_{1,22}$ of 14.4, $P < 0.001$ (99.9%). Coefficients of determination and correlation are $r^2 = 0.9975$ and $r = 0.9987$.

So, the length - weight relationship of *S. pilchardus* in Boka Kotorska Bay is:

$$W = 0.0047 \cdot L^{3.1671}$$

The logarithmic length - weight relationship, as well as 95% confidence limits to the slope of regression are shown in Figure (1).
**DISCUSSION**

The length - weight relationship of *Sardina pilchardus*, from the samples collected with beach seines with using of artificial lights (luring) in the Boka Kotorska Bay from June 2004 to July 2005 was analyzed. The values of powers of the length - weight equations were $b = 3.1671$. The comparison of regression lines showed that the difference, although it obviously existed, was significant for the very low level of probability ($P<0.25$).

Only data which can be compared with the results of our researches are the data from Kačić et al. (1987) from the area of Novigrad and Karin Bays (Croatian coast, east coast of Adriatic Sea). We found big similarity in data, especially in coefficient $b$, which was in Novigrad Bay $b=3.122$ and in Karin Bay $b=3.468$, and in our researches $b=3.1671$.

This could be explained with similarity of those coastal areas in their levels of eutrophication, because there are more nutrients in closed marine bays, then in the open sea areas. The possible differences in data could be caused by dynamic of sampling (in our researches there is one year cycle of sampling, and in theirs there is only the spring aspect).

On the Western coast of Adriatic Sea there are only the data for adults and larvae of sardine, not for juveniles, so unfortunately it is impossible to compare the results.
References


