The ichthyoplankton samples as indirect characteristic of the thermal regime of the Ocean

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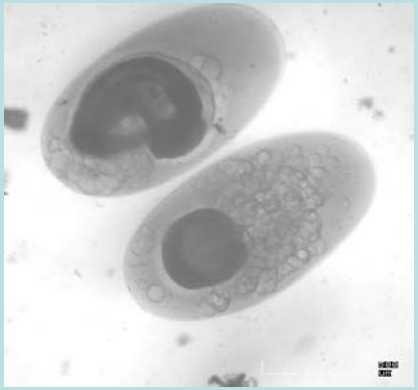
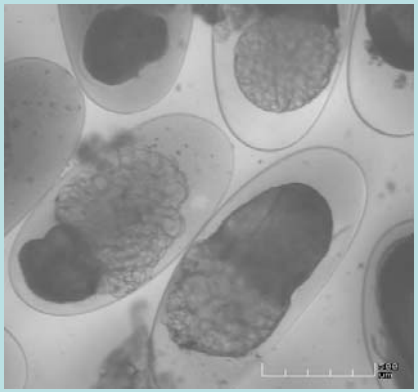
Introduction

Living organisms are closely associated with inhabitantion, therefore they are most effective indicators of its condition. Resistance to influence of environmental factors is reduced at the small planktonic forms, eggs and larvae of fishes also.



Embryogenesis is short period in the fish's life cycle when organisms are most sensitive for influence of changes salinity, oxygen concentration and water temperature.

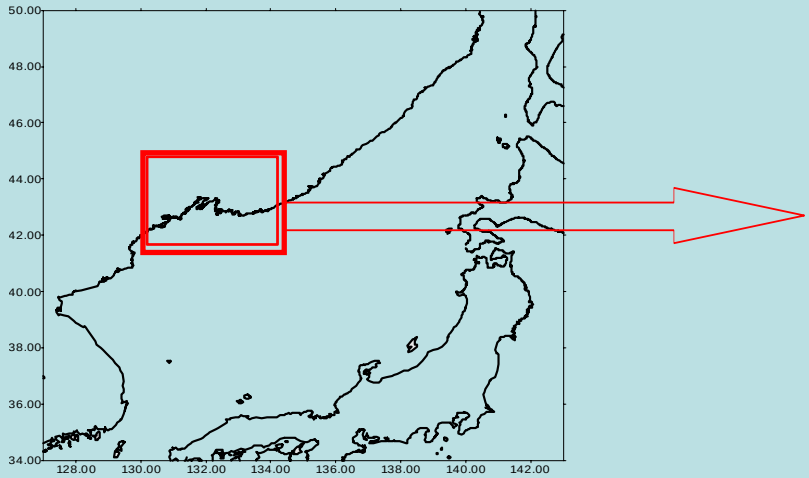


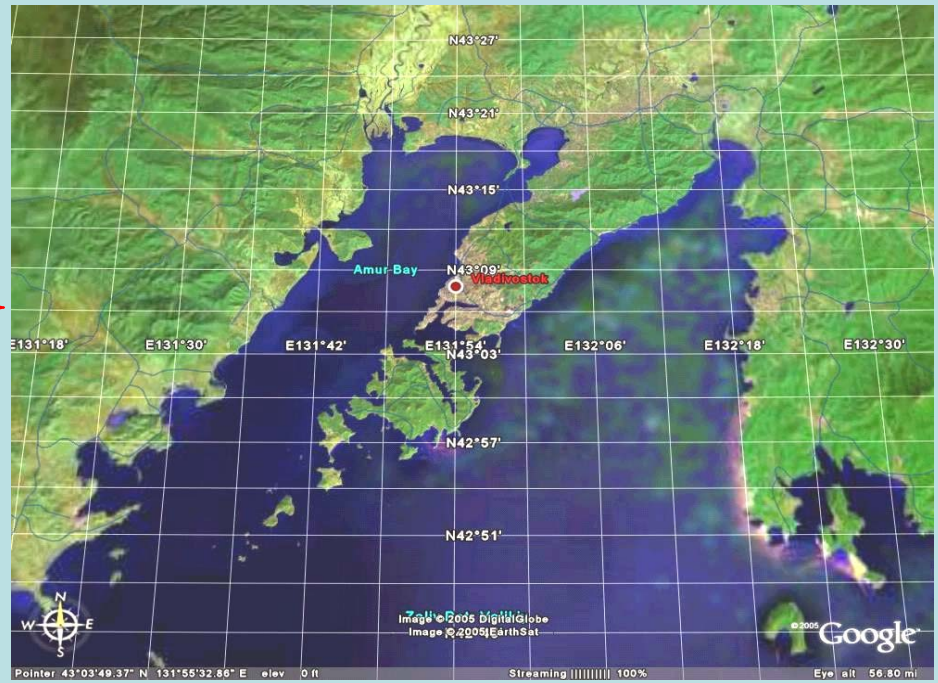
The last factor determines speed of embryo-development, duration of embryogenesis and ratio eggs on different stages of development in ichthyoplankton samples.

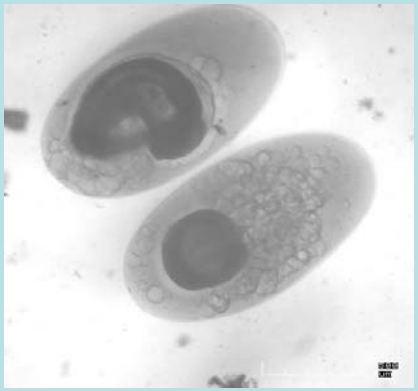
Therefore, quality of eggs samples can be indirect characteristic of thermal regime of water and its changes.

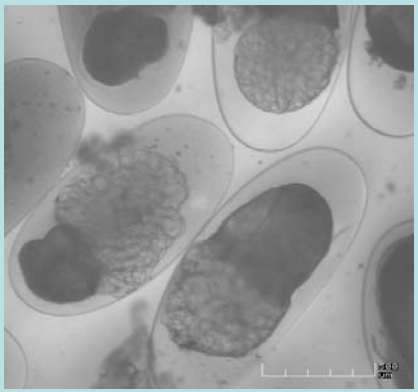
Data and Method

According of this postulate investigation of ichthyoplankton samples of several species of fishes was provided from 1996 to 2003 in the Japan Sea (the Great Peter Bay).
Datas were collected during summer - autumn seasons.







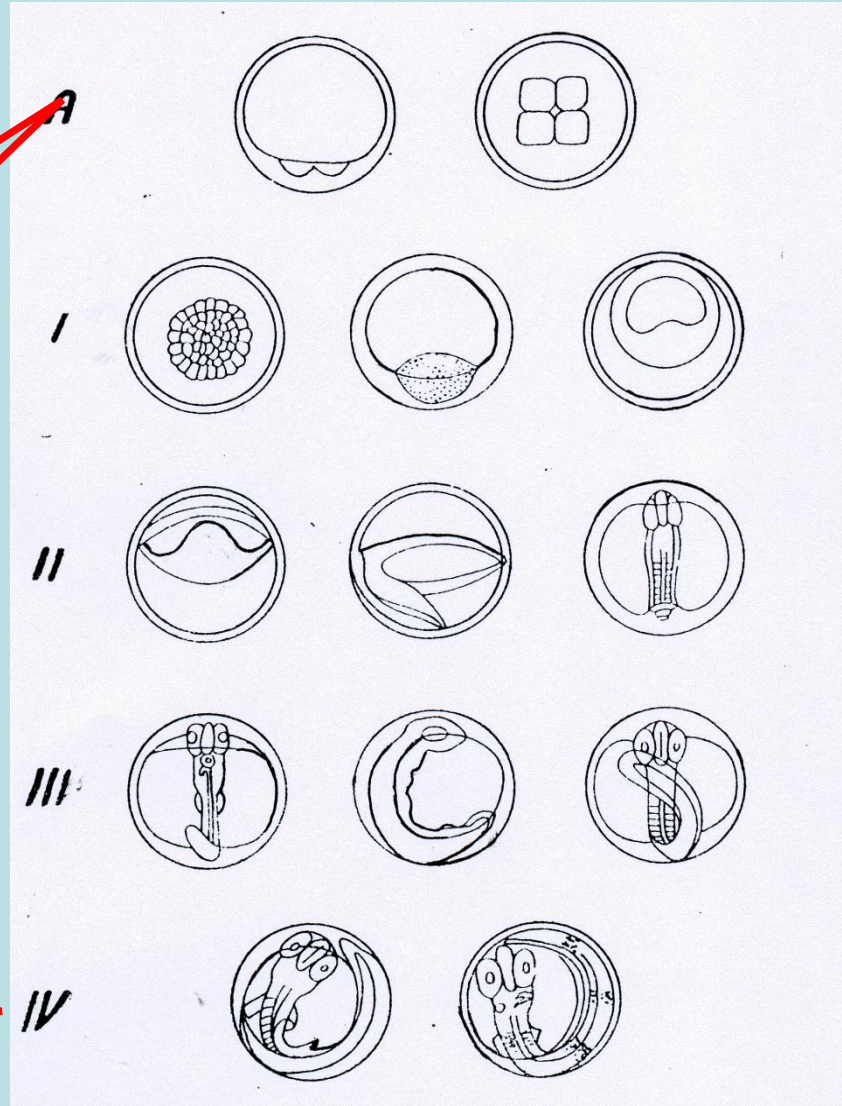


As algorithms, three indices were taken:

- **1. changes of share eggs at different stages of development (relative index of samples)**
- **2. changes of number of eggs at different stages of development (absolute index of samples)**
- **3. correlation of eggs and larvae in samples (Egg/Larvae index)**

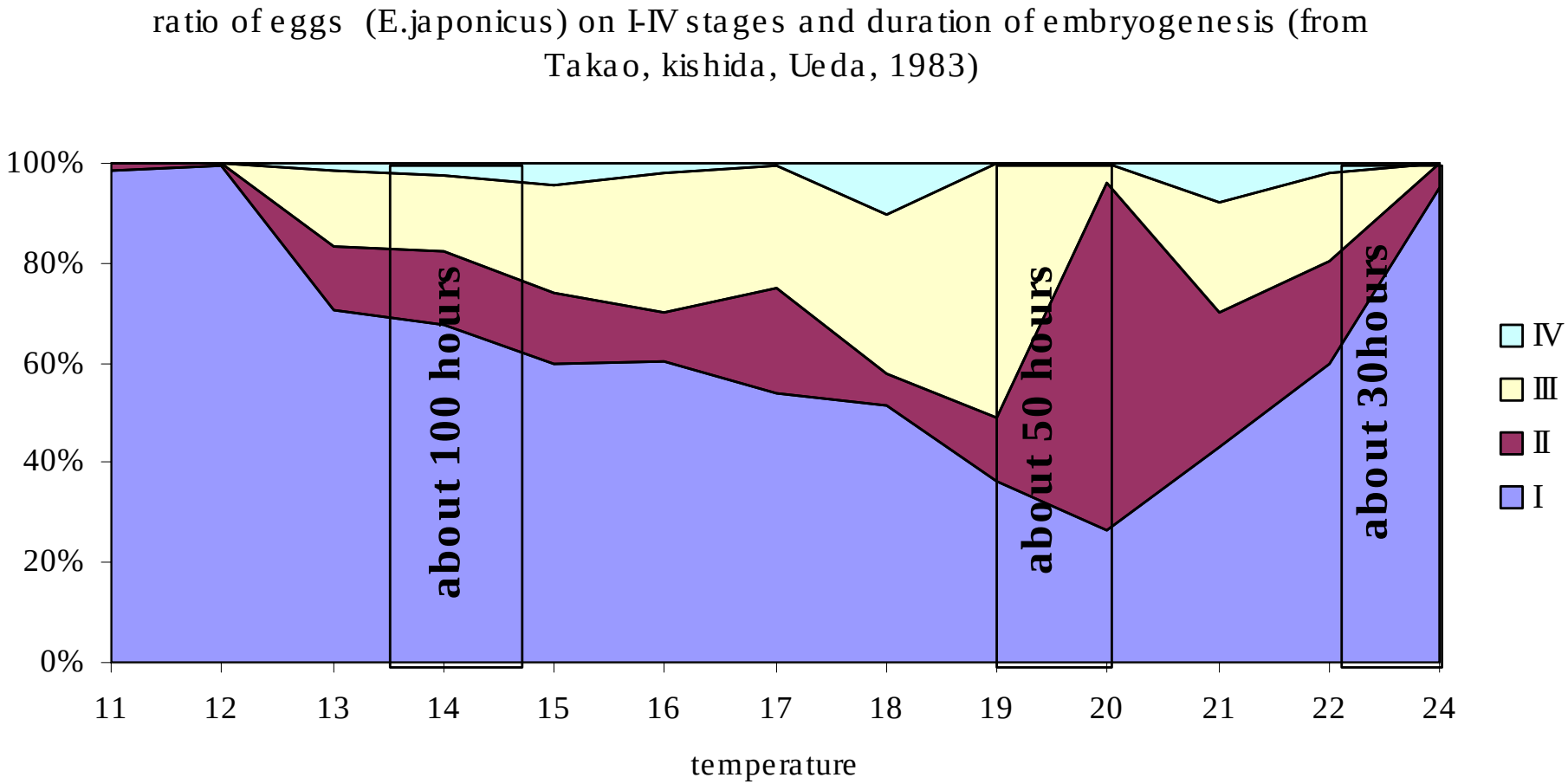
1. On the base of analyze of ichthyoplankton samples collected in 11-24ºC water temperature ratio eggs at different stages…..

Early embryogenesis after fertilization in water

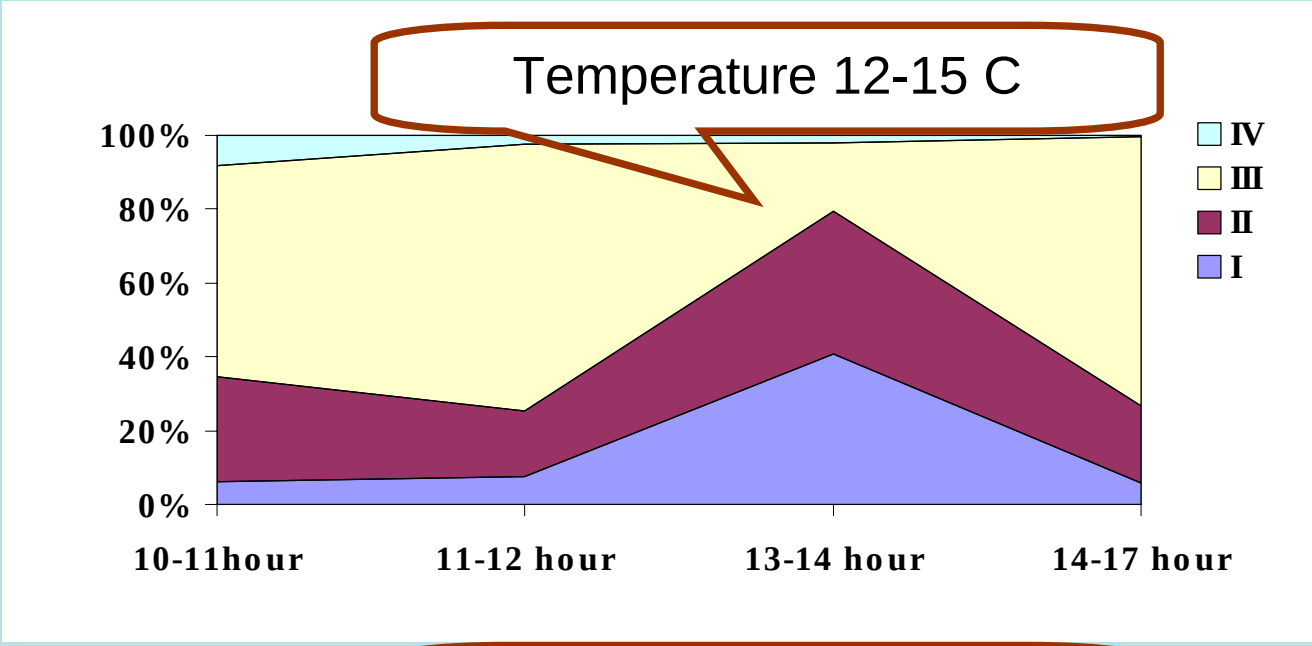


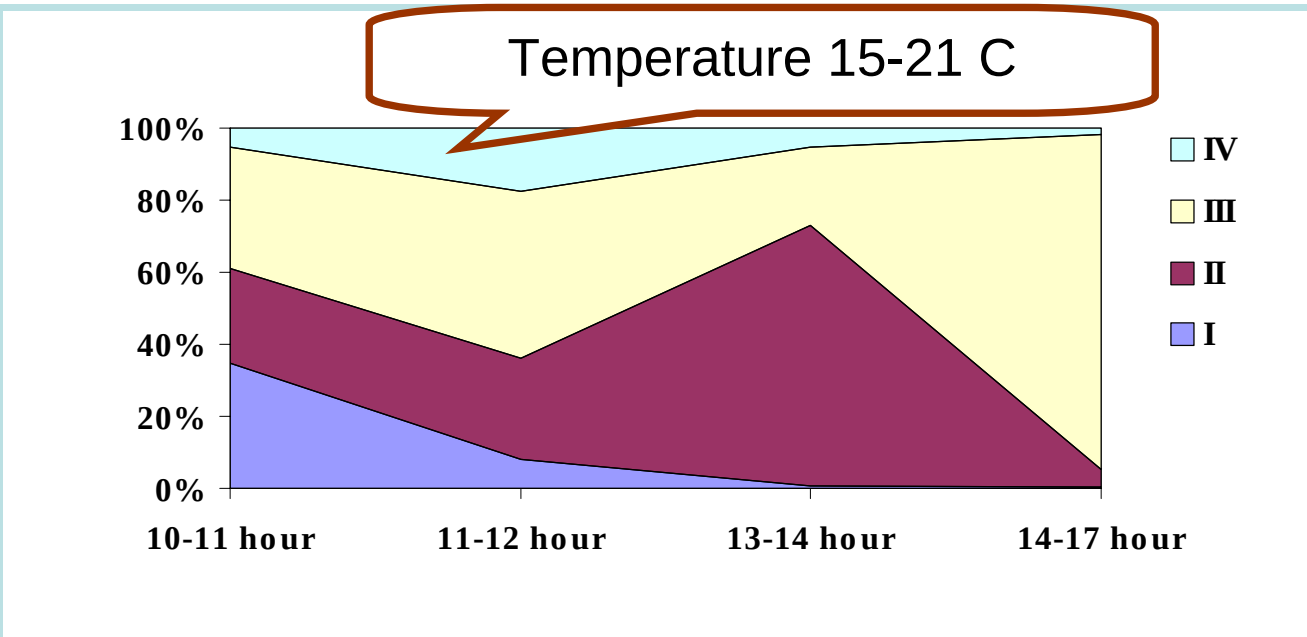
Before catching

…..evidently was changed

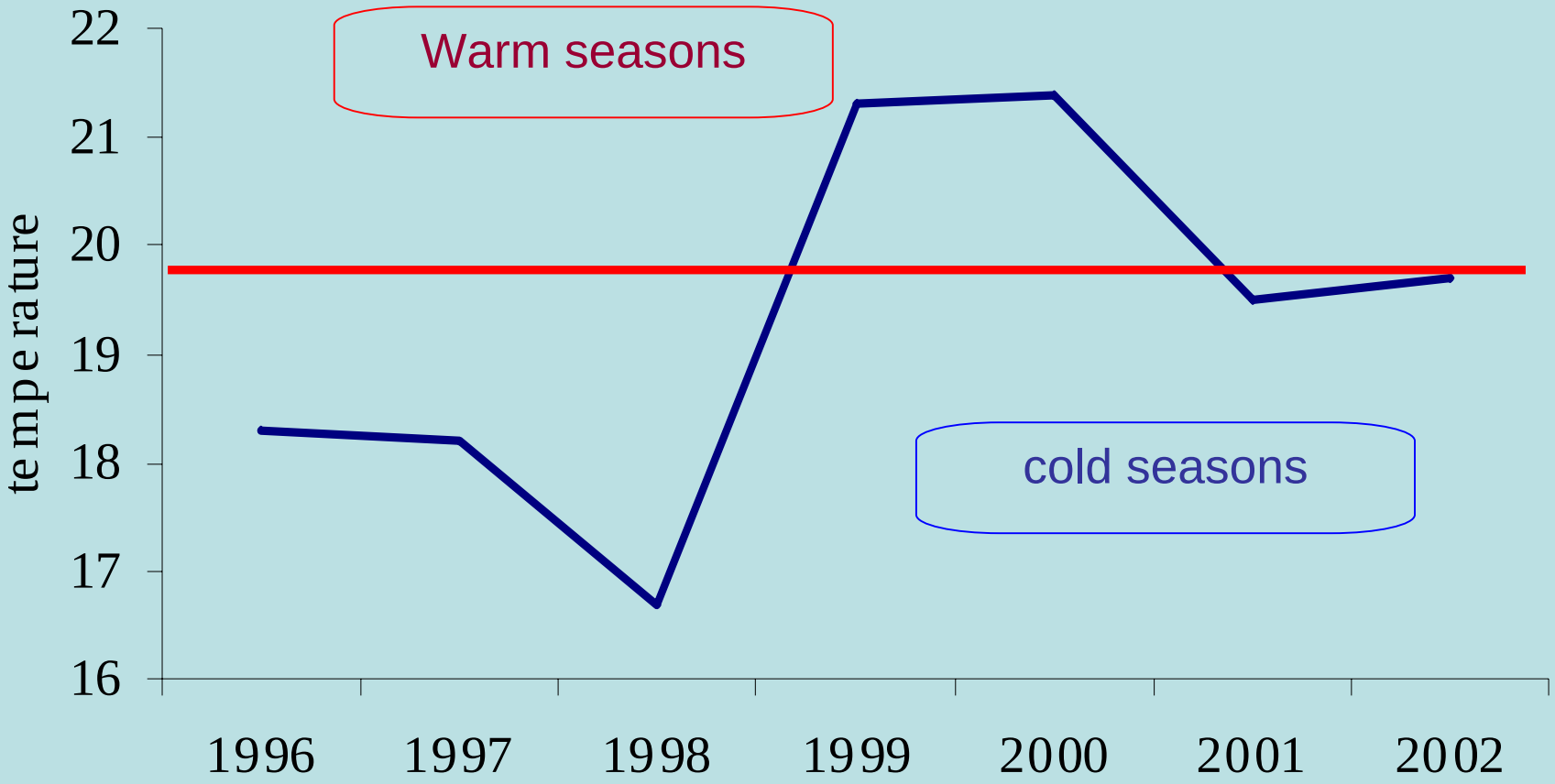


2. What can we say about inter-year changes in ratio eggs at different stages if during twenty-four hours the eggs samples composition was significantly changed ?



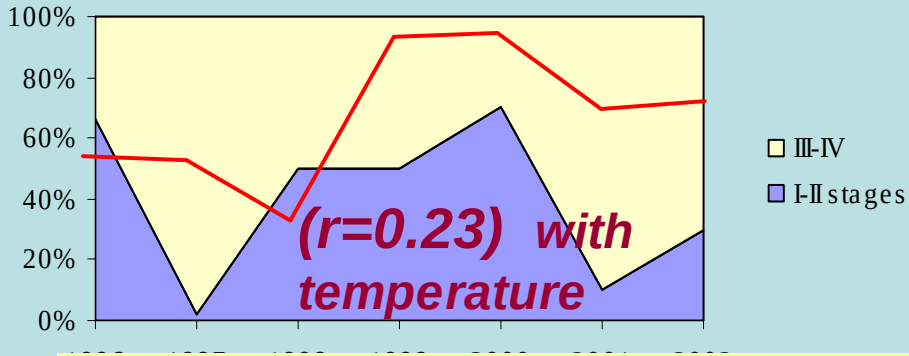


3. The water temperature (June-September) was changeable year-to-year .

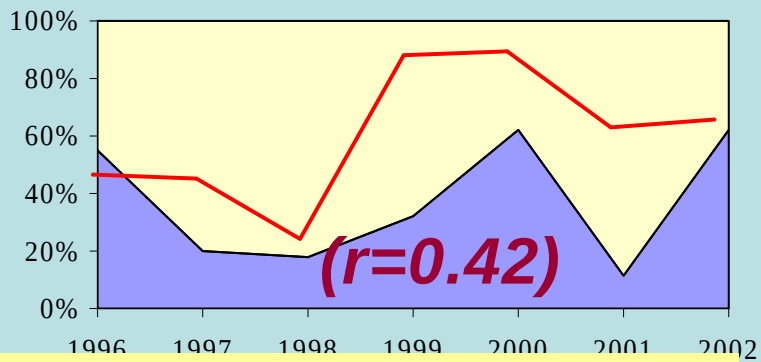


4. *Relative index.* Correlations of the eggs main wide-distributed species of fishes at the different stages of development in samples changed too.

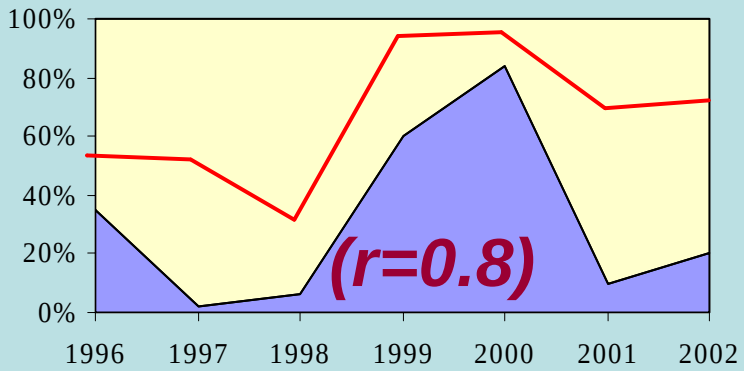
Plaice

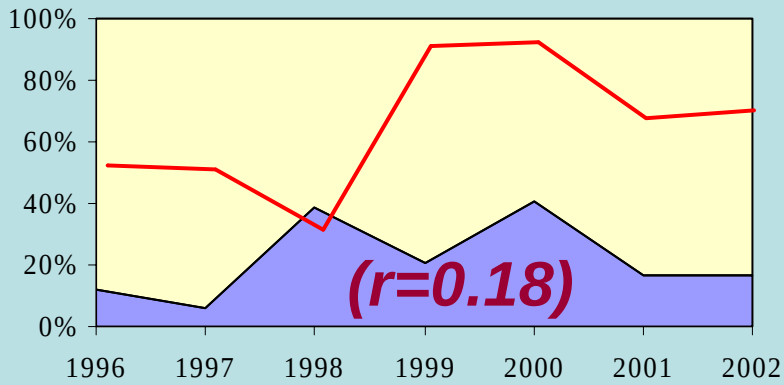


Yellowbanded flounder



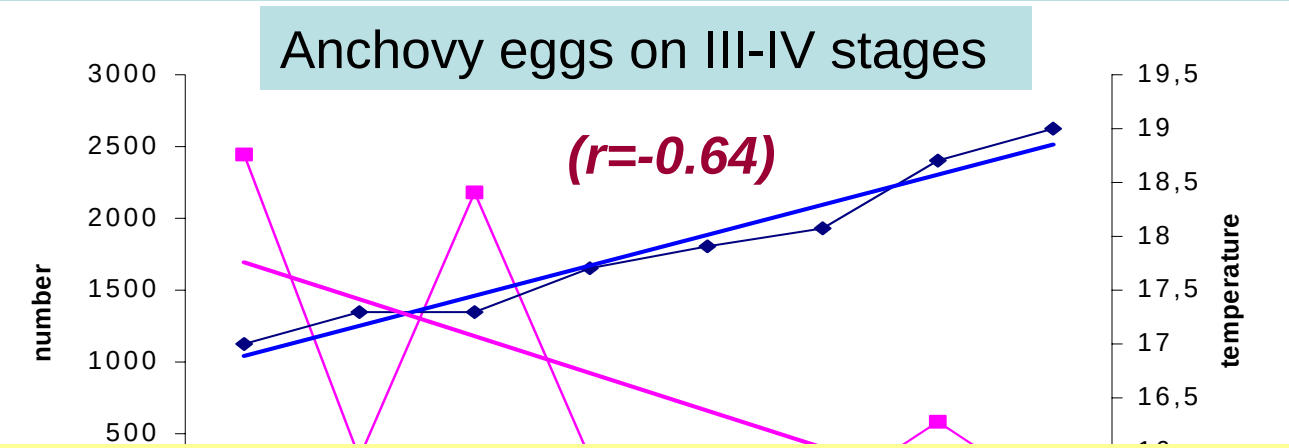
Share eggs on I-II stages (early embryogenesis) was about 60% in “warm” seasons and only 23% in “cold” seasons in average.



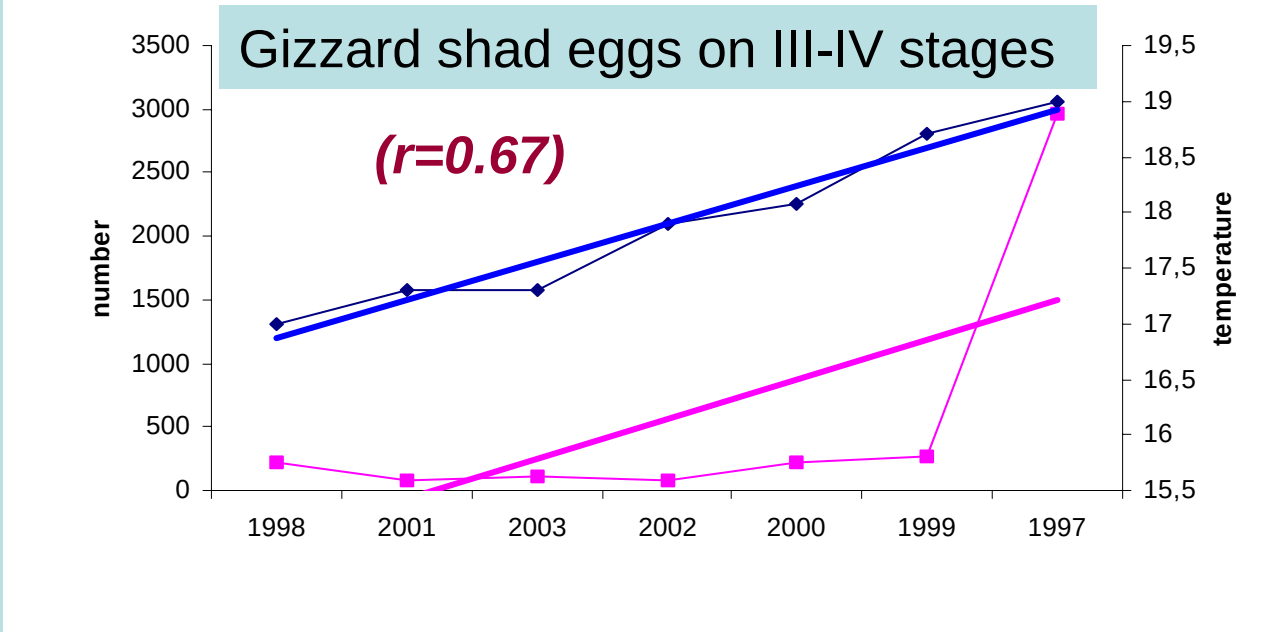


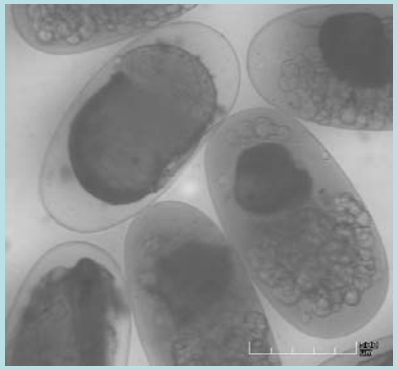
5. *Absolute index.*

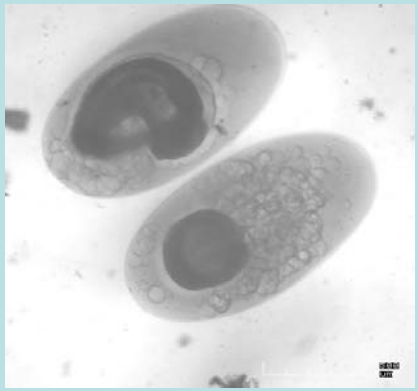
The dates were sorted according to the changes eggs number (on the different stages) in samples and water temperature at which eggs were caught from 1996 to 2003.

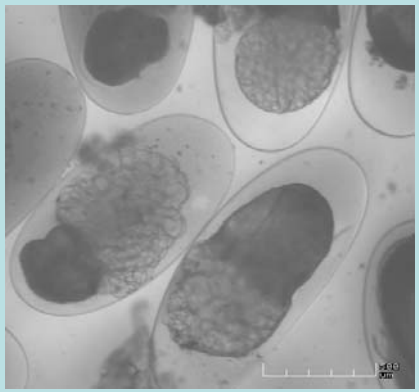


Inter-year changes number of eggs *anchovy and gizzard shad* on III-IV stages would be representative indicator of the temperature regime.









1.Conclusion

Absolute (r=0.-64) and Relative (r=0.8)

indices of the eggs E.japonicus samples

are more representative indirect characteristics

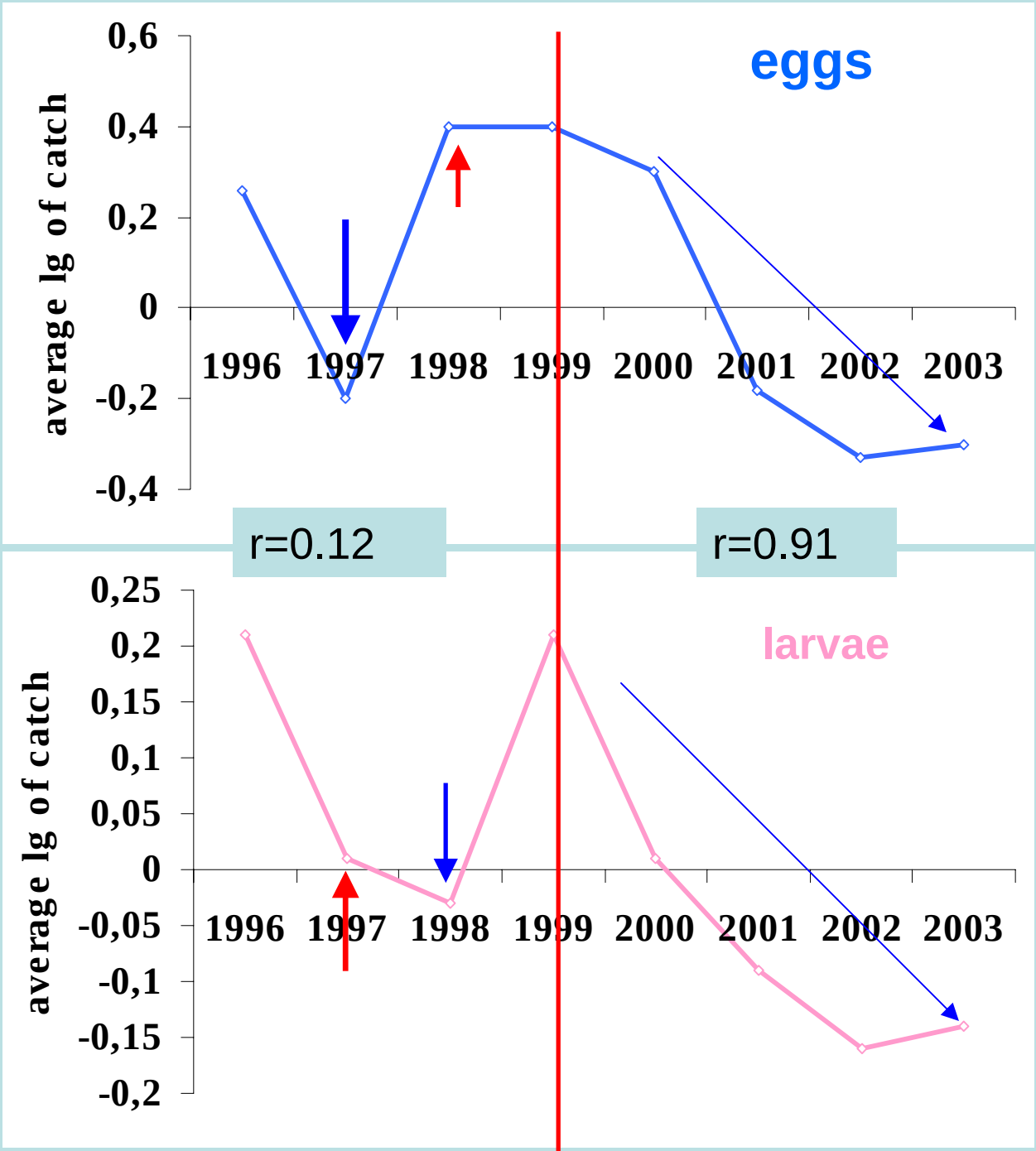
of the thermal regime of water.

6. All years were divided into two different periods:

1. **1999-2002** with high correlation of catches eggs and larvae;

2. **1996-1998** with low correlation of catches eggs and larvae.

Peculiar situations we observed in **1997** and **1998** when number of eggs weak correlated with larvae.



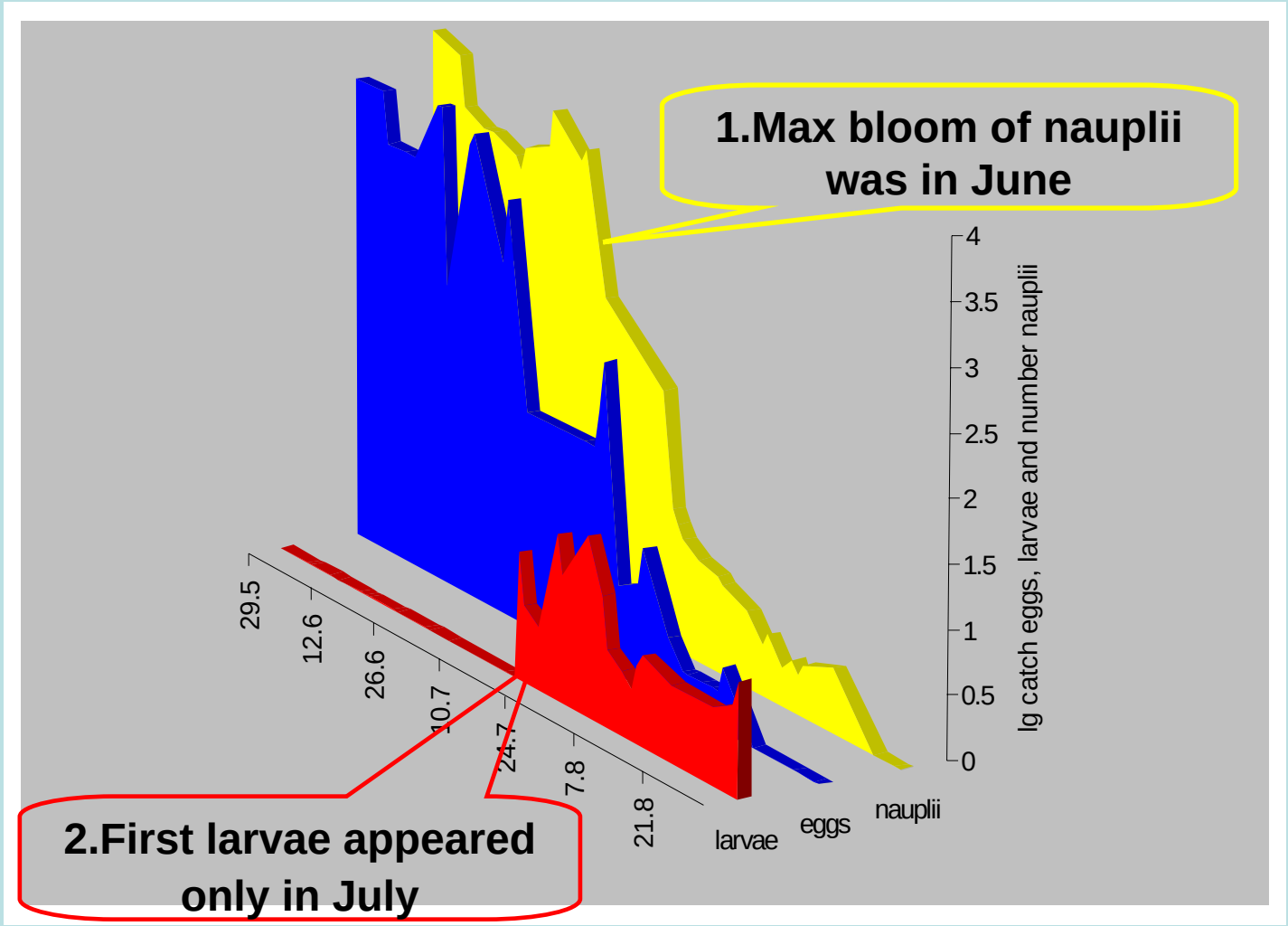
Therefore two years were compared ……

1996	1998
Late spawn - 27.06	Early spawn - 28.05
Total catch of eggs - 3519	Total catch of eggs- 295352
Weak wind- 0.3 m/sec	Strong wind -1.4 m/sec
Strong stratification of water	Weak stratification of water
Water temperature – 18.5	Water temperature - 16.8
Normal developing eggs- 53.9%	Normal developing eggs- 14.1%
Larvae -17.1%	Larvae- 0.3%

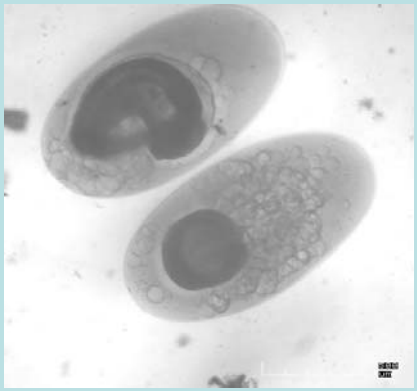
Index E/L - 15.8 **Index E/L - 397**

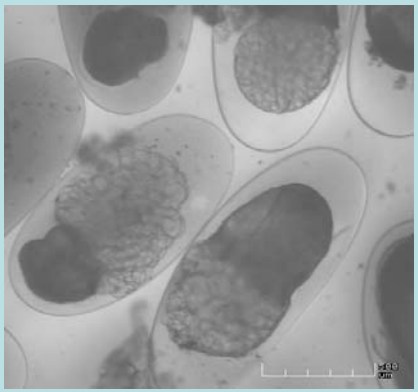
We can suppose that low number of larvae was result of the unfavorable conditions during larval period (especial feeding conditions)?

Comparison season dynamic of eggs, larvae and nauplii copepods shown…..



Therefore high mortality was during embryogenesis.





2.Conclusion

1.Intensity spawn and number of larvae closely correlated.

2. But this connection was broken by stress environment situation during spawn period (mostly water temperature).

3.Therefore least number of larvae was born from numerous number of eggs.

4. High E/L index can be signal of unfavorable condition embryogenesis.

Thank you.
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