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Comparison growth parameters of shellfish from Adriatic Sea in Butrinti Lake

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Abstract :

Butrinti lagoon is situated in the southern part of Albania. It is the only lagoon connected with the Ionian Sea and due to the specific rocky shore of this sea. The water temperature varies with depth and season. In depth 8-10m it is nearly stable throughout the year, respectively 15-17°C. Eutrophication and depth influences ecology and fisheries of Butrinti Lagoon. Due to the depth of 21m, the water in the lagoon is stratified in different layers according to different gradients of temperature, salinity and chemical compounds.There are some factors that define these critical issues in the lagoon. Recent assessments founded that, in summer there is a risk of hyper-eutrophication, when bacteria breaking down organic matter become hyperactive in the heat and available oxygen in the process. In anaerobic conditions the sediments release hydrogen sulphide, which is highly toxic for flora and fauna and can kill populations beyond the point of possible recovery. Stratification process makes that in the deep layers when thermocline and chemiocline are created, the oxygen is consumed very rapidly and big amount of H_2S are present. The water ecosystem equilibrium in the lagoon is very fragile. In our experiment are transferred samples shellfish from Shengjini to Butrinti. The samples are analyzed in the periods December 2012 - March 2013 and August - September 2013. From analyzes had these results: Growth positive rate from samples mussels at December 2012 and march 2013. During the period of summer August –September 2013 the measurements have shown that there has been no increase in length mussel , argued that the death of her massive of the critical condition. In August analyzes , mussels predominate until 6.7 cm , and is currently fully curb the growth of mussel. Indicators of circles to represent dynamic growth rate of mussel growth in the period from April to June.

Keywords : shellfish, anaerobic conditions, samples, chemical compounds

1. Introduction

In our experiments we study the comparison growth parameters between shellfish development in both the marine ecosystems of Shengjin and the Butrint lagoon [1]. Butrinti lagoon has an area of 1600 ha It has a maximum 5.4km long and 1.4km wide. It is situated in the southern part of Albania. It is the only lagoon connected with the Ionian Sea. Butrinti complex includes Butrinti lagoon, Bufi lake, Pavllo and Bistrica rivers. It is connected to the sea via a channel, 1 km length, 80– 120 m width and 6 m depth. On the south western part of the lagoon there is another channel that connects Butrinti lagoon with Bufi lake. This channel is smaller with 300 m lengths, 12 m width sand 5 m depths.. The lagoon is situated of an altitude 36,5m above sea level. The entrance of Butrinti delta plain starts in the northern part with dry mudflats and abandoned terraces on outcropping rocs [2]. Butrinti lagoon lies within the Mediterranean Climatic Zone, Central Sub-zone [3]. The average rainfall is 1200 – 1300mm during 95 – 100 days of the year. Two thirds of this occurs in November to March, with peaks in October and November. The winter is mild, with January the coldest month of the year (average temperature 11.9°C) and the hottest month is July (average temperature 27°C) [4]. The mean annual temperature is 20°C. The wind has two main directions - southeast during autumn and winter and northwest during spring and summer. The main hydrological factor is the water exchange between the lagoon and the sea (tide phenomenon, wind etc.). Salinity varies considerably from one area to another, and between seasons [5]. Due to the fact that the lagoon is deep, there is a stratification of the water according to the salinity rates. In the surface the salinity is estimated to be 13 - 26 ‰. This is up to depth of 8m. From 8m to the maximal depth of 21m

the water is more salted 30 - 36 % and it is constant. The level of oxygen is strongly connected with temperature [6]. Other factors that play an important role in the oxygen level are photosynthesis and oxidation processes [7]. During cold season oxygen level is high (about 10.2 ml/l) because due to the low temperature photosynthesis and oxidation processes develop very slowly. In the summer the level of oxygen is lower (7.2 ml/l) [8, 9]. From a study done by the pertinent specialists' results that the layer from 8m depths until the 21m has no dissolved oxygen amount and the temperature is constant at 16°C [10]. Concerning the level of pH it varies from 7.8 to 8.9 degrees [11]. The Shengjin mussel farm is located in a protected bay on the Adriatic Sea in the area of Shengjin which is in the north-west part of Albania. Zone of bay Shengjin is favorite for good growth of shellfish. Water parametrs in this zone are very comfortable for shellfish growth [12,13,14,15]. This zone is no noted to growth the shellfish until 10 years ago. Thus , in Shengjin Bay the cultivate of shellfish and enterprise was created in 2007 and has a production area of 40.000 m^2 where they grow mussels from loglines. Because of this experiment study the comparison the growth parameters between two zones Shengjin and Butrinti.

2. Materials and methods

We have done four cruises from Shengjin (Adriatic sea) to Butrinti Lagoon. In December 2012, March 2013, august, 2013, September 2013. Water was sampled from the Butrinti lagoon and the Adriatic Sea at 3, 5 and 7 meters depth.We measured Salinity, O_2, H_2S, S%, NO_2, NO_3, P, transparency, pH, algae, temperature. Mussels were sampled from Shengjin and the Butrint Lagoon at two occasions. We analysed 50 individuals from each group of mussels; two groups from Shengjin and one group from Butrint Lagoon. In other cruise we analysed string of mussels place in Butrint lagoon Mussels were sampled for morphological measurements and meat yield determination in the laboratory. We measured shell length (L) shell width (H) or shell weight (W) meat weight (MW) . Equipment that used during this study were Multiparameter WTW, Chlorophyll sonde, electronic caliper. Graphics were prepared at the Aquaculture and Fisheries Laboratory at Durres.

3. Results and discussions

- Samples transferred from Shengjini to Butrinti were growing, but not normal, because of heavy fouling with barnacles (*Balanus spp).*
- Samples taken a month ago at Shengjin (Adriatic Sea) were free from bio fouling and had very good development.

Since 1959 in this lagoon have happened 10 dystrophic crises. Some of them were real biological catastrophes. From the analysis done results that there are some reasons such as temperature increasing, until 29-30 °C, water stagnation, algae production increasing especially in spring and autumn, that cause the increasing of the amount of organic matter bringing as a consequence the high consumption of oxygen and H_2S.

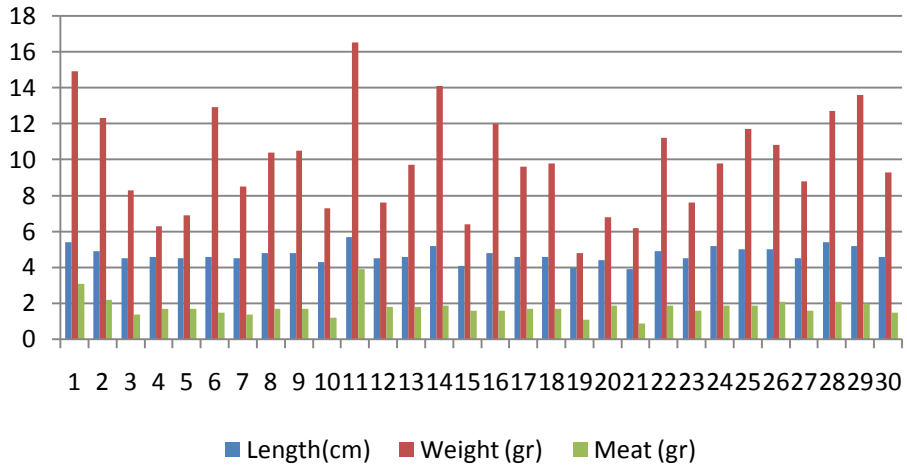

Figure 1 : Relation of growth parameter in shellfish Butrint.

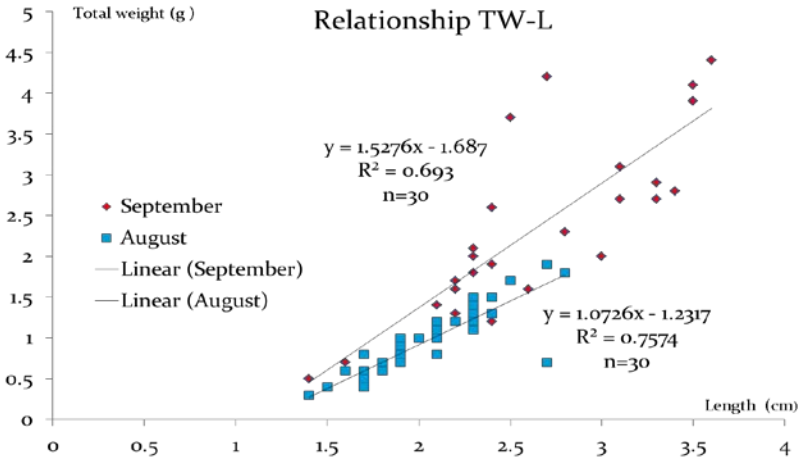

Figure 2 : Growth parameters shellfish from Butrinti Lagoon and Adriatic Sea

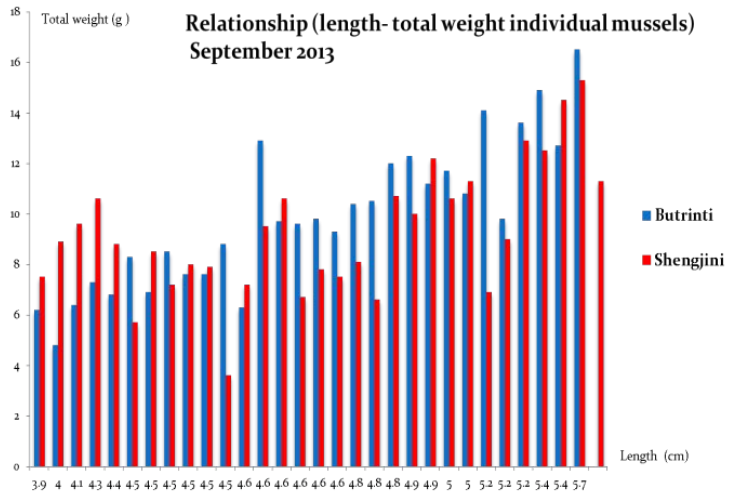

Figure 3 : Relationship (L-W) from shellfish Butrinti and Shengjin

There are some factors that define these critical issues in the lagoon:

- There is freshwater draining into the lagoon from Bistrica river, which has cold water and Pavel river, which has warm water. There is also water exchange with Bufi lake through Rreza channel.
- There is exchange of water with the sea through Butrinti channel
- There is pollution from sea and land
- The level of oxygen is strongly connected with temperature. Other factors that play an important role in the oxygen level are photosynthesis and oxidation processes.

The phytoplankton of the lagoon shows seasonal dynamics characterised by a high peak in the spring and a small peak in the autumn

4. Conclusions :

From this study and monitoring for the period two years , we reach some conclusions. The results were as expected.We had a hypothesis that growth would be best and in one location compared to another. The growth mussels were good when transferred from Shengjin to Butrinti, but the initial was the period of acclimation that stopped growth. The fouling of Balanus don't limit growth. From an assessment made results that, in summer there is a risk of hyper-eutrophication, when bacteria breaking down organic matter become hyperactive in the heat and available oxygen in the process. In anaerobic conditions the sediments release hydrogen sulphide, which is highly toxic for flora and fauna and can kill populations beyond the point of possible recovery. Stratification process makes that in the deep layers when thermocline and chemiocline are created, the

oxygen is consumed very rapidly and big amount of H_2S is produced. Currently experiencing high mussel mortality in Butrinti. Mortality is believed to be linked to low because the conditions in this period of summer aren't favor.

- Water quality is acceptable for mussel production
- Butrinti lagoon is classified as B (depuration needed). Shengjin (Adriatic sea) is classified as A.

As it seems to be the water ecosystem equilibrium in the lagoon is very fragile.

- construction of the new channels in coastal lagoons, without permission of the responsible structures
- deviation of the communication channels between the lagoon and the sea
- draining freshwater in lagoons without the permission of responsible structures
- deviation of rivers or any other flowing waters.

Monitor growth of mussels in Butrinti to find good sites for production

Relate growth to water quality in different areas was good. Compare growth of mussels from two locations; Shengjin and Butrinti .Given the development of these mussels from a northwestern area at the southwestern, would serve as a comparison for the survival of this species and the exchange of mussel seed from Butrint lagoon towards Shengjin , by serving to strengthen this activity and at the same time security administrators for the continuance of these facilities in the future, thinking for adult mussel processing in these areas.

5. Acknowledgements

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6. References :

1. Babarro M, José M, Carrington F: **Attachment strength of the mussel Mytilus galloprovincialis: Effect of habitat and body size**. 2013, Publisher: Elsevier. 188-196.
2. Corsi I, Tabaku A, Nuro A, Beqira S, Marku E, Perra G, Tafaj L, Baroni D, Bocari D, Guerranti C, Cullaj A, Mariottini M, Shundi L, Volpi V, Zucchi S, Pastore M, Iacocca A, Trisciani A, Graziosi M, Piccinetti M, Benincasa T & Focardi S. **Ecotoxicological assessment of Vlora Bay (Albania) by a biomonitoring study using an integrated appoach of sublethal toxicological effects and contaminant levels in bioindicator species**. J. Coast. Res.2011, 58:116–120.
3. Ruiz M, Tarifeno E, Llanos-Rivera A, Padget C. Campos B. **Temperature effect in the embryonic and larval development of the mussel, Mytilus galloprovincialis** (Lamarck, 1819). Revista de Biología Marina y Oceanografía, 2008, 43: 51-61.
4. González-Riopedre M., Novás A., Dobaño E., Ramos-Martínez J.I, Barcia, R. **Effect of thermal stress on protein expression in the mussel Mytilus galloprovincialis Lmk. Comparative Biochemistry and Physiology,** 2007, Part B 147, 531-540**.**
5. Meadows D, **Leverage Points: Places to Intervene in a System**, The sustainability institute, Hartland, USA, 1999, 19.
6. Mironov S.S, Veremeeva E.V, Shadrin N.V: **Geoecology of the ocean's shelf and coasts, Hydrometizdat,** Saint-Petersburg, 2007, 304.
7. Arhonditsis G, Tsirtsis G, Angelidis M.O, Karydis M, **Quantification of the effects of nonpoint nutrient sources to coastal marine eutrophication: applications to a semi-enclosed gulf in the Mediterranean Sea,** Ecological Modelling, 2000, 129: 209-227.
8. Kashta L**: Protected Areas Gap assessment and Marine Protected Areas Development Project.** Marine Biodiversity Legislation ON PA and MPA, 2010, 42-51.
9. Donald F, Boesch T, Russell B. Robert E. **Chesapeake Bay Eutrophication**, Journal of Environmental Quality, 2001, : 303-320.
10. Brennan J.S, Culverwell H: **Marine Riparian: An Assessment of Riparian Functions in Marine Ecosystems**, Washington Sea Grant Program, Seattle, USA, 2005, 34.
11. Defeo O, McLachlan A, Schoeman S.D, Schlacher A. Th, Dugan J, Jones A, Lastra M, Scapini F, **Threats to sandy beach ecosystems:** A review, Estuarine, Coastal and Shelf Science, 2009, 81: 1-12.
12. Kolitari J, Gjyli L, Mukli L, Gjyli S, Vukaj. **Distribution of Chlorophyll a in Lagoon of Butrint waters comparing with environment factors (Albania) .**The Albanian Journal of Agricultural Sciences (AJAS) 2014, 35-37.
13. Santaclara F. J, Espineira M, Cabado A.G, Aldaroso A, Gonzales-Lavin N, Vietes J M.. **Development of a method for the genetic identifi cation of mussel species belonging to**

Mytilus, Perna, Aulacomya, nd other genera. Journal of Agricultural and Food Chemistry 2006, 54: 8661- 8470.

14. Toro J, Ojeda L, Vergara A, Castro G. and Alcapan A: **Molecular characterization of the Chilean blue mussel (*Mytilus chilensis* Hupe 1854) demonstrates evidence for the occurrence of *Mytilus galloprovincialis* in southern Chile.** Journal of Shellfi sh Research, 2005, 24(4):1117-1121.

15. Westfall K, Gardner J. **Genetic diversity of Southern hemisphere blue mussels (*Bivalvia*: Mytilidae) and the identifi cation of non-indigenous taxa.** Biological Journal of the Linnaean Society, 2010, 101: 989-909**.**