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Condition Indices of Mediterranean Mussels (*Mytilus galloprovincialis* L. 1819) Growing on Suspended Ropes in Dardanelles

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Abstract: The present study was conducted in Kilya (Poyraz) Bay, Dardanelles in May 2002 – April 2003. Seasonal variations of condition indices of mussels (*Mytilus galloprovincialis* L. 1819) was discussed in connection with some environmental parameters such as temperature, salinity, seston and chlorophyll-a. This study, testified that there is a statistical relation between condition indices and cholorophyll-a ($p<0.05$). The mussel condition indices in infralittoral zone were 24% higher than the in mediolittoral zone in Dardanelles. It is observed that the condition indices reached highest levels in May and June. Due to spawning, there was a sharp fall in July. While the condition indices is ascending in summer, it was at low levels in winter. According to the results, condition indices of mussels in Dardanelles is suitable for mussel culture. The optimum harvest period of mussels in Dardanelles is also determined as May-June.

Key words: Mussel, *Mytilus galloprovincialis*, environmental factors, condition indices

INTRODUCTION

Determination of condition indices on bivalves is important for both growers and researches. Problems in comparing bivalve condition indices between various studies exist primarily due to the lack of an accepted standard method. In this study, condition indices was determined by the method described by Bressan and Marin[1,2].

Condition indices of the bivalvia exhibit seasonal variations[3]. This situation is of quite relevance with water temperature and food adequacy and gametogenic cycle[4,5].

The condition indices pattern should reveal the optimum period for marketing. Using this factor, Zandee *et al.*[6] showed that the proper period for harvesting in the Netherlands is around June-July to February. It is also reported that Mediterranean mussel meat content was maximum before spawning in September- October period which suitable for harvest in Chile,[7].

In this study, condition indices of mussels and environmental parameters of water in Dardanelles were monitored in monthly periods. Thus, it was determined whether condition indices are suitable for mussel culture and optimum harvesting period.

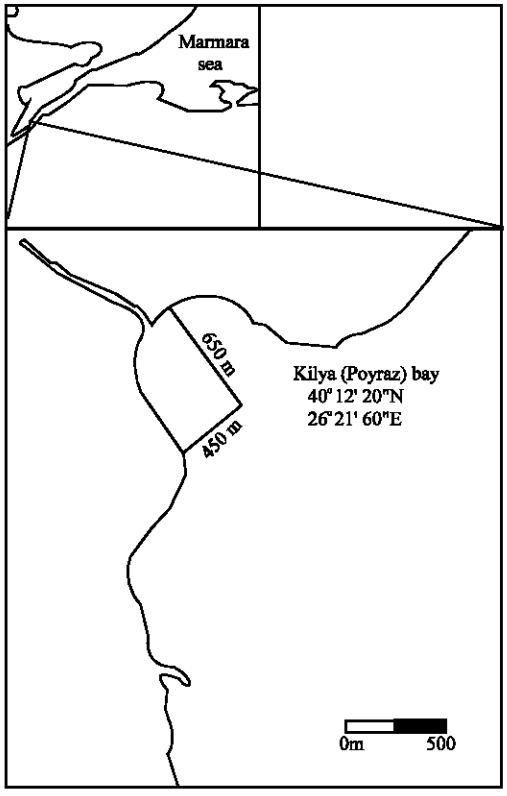

Fig. 1: The study area

MATERIALS AND METHODS

The study was carried out in Kilya (Poyraz) Bay in Dardanelles between May 2002 and April 2003. Kilya Bay is 3 km from Eceabat town; at 40°12'20'' and 26°21'60''. The Bay is 650 m long and 800 m wide (Fig. 1)[8].

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Temperature, salinity, seston and chlorophyll-a values were also determined monthly in Kilya Bay. The sea water were sampled below 1 m than surface in the study area. Temperature and salinity was measured with mercury thermometer and refractometer, respectively. Seston and chlorophyll-a were determined[9] method after filtering the water samples with 0,45 µm filter paper.

Each sampling mussel unit consisted of polypropylene rope having 60 mussels of 20±2 mm shell lenght on main body. Mussels on rope covered with a thin cotton net. 12 ropes were prepared and hung 1m below than surface on a main body. Cotton material /tread (net) worn off in several days. During this period, mussel attachment was completed. This study was conducted in infralitoral zone whose depth was about 15 m. A rope was detached from main body every month. Numbers and average lenght of mussels on ropes were given in Table 1 as monthly. After cleaning of organisms like polychaete and fouling, weight, size, wet meat, wet shell, dry meat and dry shell measurements carried out regularly. Following these measurements, condition indices and meat yield were calculated using the below methods:

1) Meat yield = Wet meat/total weight x100[10]

Firstly, mussel weight measured before long in order to prevent water loss. Then mussels shelled excess water was drained on blotting paper. Wet meat was weighed with Scaltec scale (In 0.01 g) sensitivity.

2) Condition indices = Dry meat weight/dry shell weight x100[2]

Wet meat and shells were dried at 60°C for 48 h in an oven. And obtained data used in condition indices calculations.

Correlation analyses were performed on enviromental parameters on the sea water from Kilya Bay. Nonparametric x^2(Chi Sqaire) tests were applied on the data in order to determine condition indices variations monthly. Correlation analysis performed between mussel condition indices and water environmental parametres[11].

RESULTS

Water temperature varied between 8.3°C and 25.2°C, while salinity ranged between ‰19 and 25.5 (Fig. 2). Minimum and maximum chlorophyll-a values of 0.34 µg L and 8.82 µg L were observed in June and October, respectively (Fig. 3).

Although there was a significant relation between salinity and temperature ($p<0.05$), there was not any correlation among other environmental parameters ($p>0.05$).

Shell length, percentage of meat yield and condition indices of mussels that sampled monthly during the study are given in Table 1.

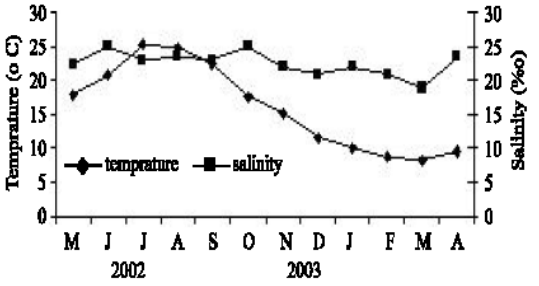

Fig. 2: Variations in temperature and salinity values

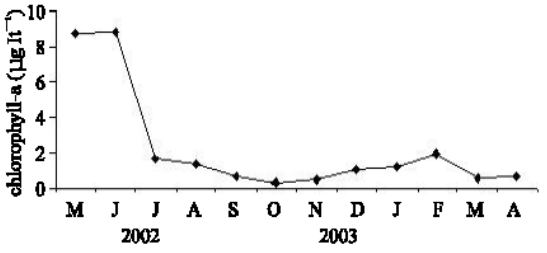

Fig. 3: ChlorophyII-a changes in Kilya bay

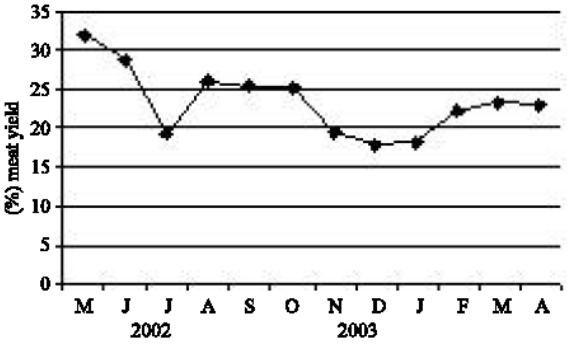

Fig. 4: Mussel % meat yields in Dardanelles

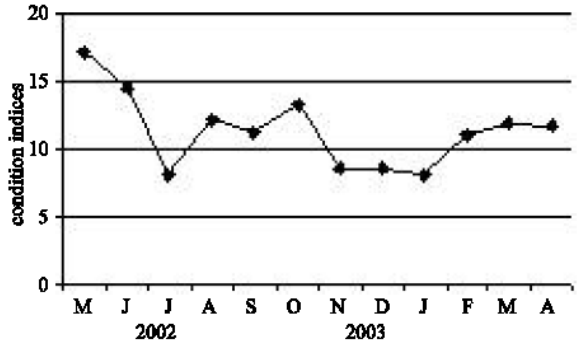

Fig. 5: Mussel condition indices in Dardanelles

The meat yield reached highest level on average 32.04±1.23% in May 2002. The yield fell Down slightly during summer, particularly in July; increased in autumn and dropped lowest levels in winter (Fig. 4). Condition indices followed similar pattern with meat yield. The highest condition indices value were 17.23±0.89% in May 2002. Later immediate decrease was observed in the

Table 1: Numbers and average lenght of mussels according to months in dardanelles

Date	Mussel number	Length (mm) ± Sx	%Meat yield	Condition indices
May 2002	60	20.68±0.18	32.04±1.23	17.23±0.89
June 2002	54	27.44±1.21	28.72±1.89	14.57±1.14
July 2002	52	32.22±0.98	19.20±1.17	8.09±0.91
August 2002	50	34.98±0.89	26.18±1.01	12.18±1.13
September 2002	47	39.02±1.17	25.44±1.28	11.23±0.94
October 2002	42	41.12±1.01	25.13±1.71	13.26±1.08
November 2002	41	43.18±0.75	19.64±0.93	8.61±0.83
December 2002	41	45.71±1.08	17.81±0.87	8.63±0.75
January 2003	40	47.10±0.67	18.13±1.14	8.18±0.81
February 2003	40	47.96±0.73	22.17±1.04	11.12±0.68
March 2003	40	49.68±1.14	23.33±1.28	11.89±1.12
April 2003	38	51.65±0.97	23.12±1.71	11.67±0.71

condition indices in July 2002 (8.09±0.91%). During summer values increased and autumn period, in winter they were at minimum levels. (Fig. 5).

Nonparametric x^2 (Chi Sqaire) tests were applied on the data in order to determine the significance of the changes in both meat yield and condition indices monthly. There was no significant differencies in condition indices according to the months ($p>0.05$). Significant correlation was found between the condition indices and chlorophyll-a ($p<0.05$).

DISCUSSION

Fluctuations in condition indices and meat weights is important for mussel culture and harvest strategy. Higher condition indices are suitable for better harvest period[3].

Seasonal changes in condition of mussels resulted from the complex interactions of a variety of factors including food, temperature, salinity, metabolic activities of the mussels and particularly the growth and reproductive processes[12]. Moreover, the condition indices changes in mussels were affected by temperature and salinity in the Loch Etive[13]. Duarte *et al.*[14] on the Chilean mussel, *Mytilus chilensis*, revealed that mussels from natural banks showed typical seasonal variations in the calorific content of their soft parts due to low food conditions during the winter and the processes of gametogenesis and spawning during spring. In the peresent study, it is observed that there is a significant correlation between the condition indices and chlorophyll-a amounts ($p<0.05$). Thereby, chlorophyll-a is a determining factor for condition indices in this area. Yildiz *et al.*[15] reported that 8813 mussel seeds settled on 100 cm^2 net rope collector in July. Therefore, low condition indices in July was due to spawning. Although it is continued year long, Yildiz[16], the main spawning season in Dardanelles is February-April, It has been determined that condition indices increased after spawning season (May-June), but it is also advisable in other periods except winter season for harvesting.

Because of tidal exposure, mussels in mediolittoral zone formed thicker shells than those on collectors. Hickman and Illingworth[12] reported that mussel shell weight percentages collected from natural shore and raft cultured mussels were 49.9 and 39%, respectively. Similar results were obtained in Dardanelles. Yildiz[16] reported that annual mussel meat yield was 17,8% in different size group in mediolittoral zone. This study reveals that the condition indices in infralittoral zone was higher than mediolittoral zone in the same location. This result is also similar to the results of Babarro *et al.*[17] who has done research in different part of Mediterranean in Spain.

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