

## Seasonal Variation in Biochemical Composition of the Veined Rapa Whelk, *Rapana venosa* (Valenciennes, 1846) Caught By Beam Trawl (Algarna) in The Black Sea

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**Abstract:** This study was conducted to determine the seasonal variation in biochemical composition of the veined rapa whelk, *Rapana venosa* caught by beam trawl (Algarna) in the Black Sea. *R. venosa* samples were obtained from fishermen who fishing off Yakakent at Samsun province in the Black Sea between December 2014 and November 2015. Homogenised dried veined rapa whelk meats were used for crude protein, crude oil and crude ash analyzes. Mean crude ash values was the highest in winter (2.91±0.134%) and the lowest in spring (2.37±0.051%) (P<0.05). The mean lipid values were not statistically difference among the seasons (one way ANOVA, P > 0.05). The mean crude protein values were also not statistically difference among the seasons (P>0.05). Mean dry matter values was the highest value in winter (31.33±0.448%) and the lowest in spring (30.01±0.280%). The dry matter values in winter was also statistically higher than spring (P<0.05). Food availability, plankton composition, temperature, reproduction activities, analysed tissues such as gonad, digestive gland, foot and mantle are the important factors effect the biochemical composition of rapana. Thus, these factors should be take into account in the future studies.

**Keywords:** Veined rapa whelk, *Rapana venosa*, biochemical composition, season, Black Sea

### Karadeniz'de Algarna İle Avlanan Deniz Salyangozunun (*Rapana venosa* Valenciennes, 1846) Biyokimyasal Kompozisyonunun Mevsimsel Değişimi

**Öz:** Bu çalışmada, Karadeniz'de algarna ile avlanan deniz salyangozunun, *Rapana venosa*, biyokimyasal kompozisyonunun mevsimsel değişimi araştırılmıştır. Deniz salyangozu örnekleri Aralık 2014 ile Kasım 2015 tarihleri arasında Karadeniz'in Samsun ili Yakakent ilçesinde avlanan balıkçılardan elde edilmiştir. Kurutulmuş deniz salyangozu numuneleri homojenize edilerek ham protein, ham yağ ve ham kül analizi için kullanılmıştır. Ortalama ham kül değeri en fazla kış mevsiminde (%2,91±0,134), en düşük ilkbahar mevsiminde (%2,37±0,051) (P<0,05) tespit edilmiştir. Ortalama ham yağ miktarlarının mevsimler arasında tespit edilen istatistiki fark önemsiz çıkmıştır (one way ANOVA, P>0,05). Mevsimler arasında ortalama ham protein miktarları arasındaki fark istatistiki olarak önemsiz bulunmuştur (one way ANOVA, P>0,05). Ortalama kuru madde değeri en yüksek kış aylarında (%31,33±0,448), en düşük ise sonbaharda (%30,01±0,280) tespit edilmiştir. Kış mevsiminde tespit edilen kuru madde miktarı aynı zamanda istatistiki olarak da ilkbahardan yüksektir (P<0,05). Deniz salyangozunun biyokompozisyonuna yem uygunluğu, plankton çeşitliliği, sıcaklık, üreme aktivitelerinin etkisi önemlidir, ayrıca gonat, sindirim bezleri, ayak ve manto kabuk gibi organların biyokompozisyonların bilinmesi de gereklidir. Bu yüzden, gelecekte yapılacak çalışmalarda bu faktörler dikkate alınmalıdır.

**Anahtar Kelimeler:** Deniz salyangozu, *Rapana venosa*, biyokompozisyon, mevsim, Karadeniz

## 1. INTRODUCTION

The veined rapa whelk *Rapana venosa* (Valenciennes, 1846) is also known a large predatory marine gastropod such as *Mytilus galloprovincialis* and *Chamelea gallina* in the Black Sea (Bilgin et al, 2014) and it is one of the most commercially important crustacea in

the Turkish Seas. It has been captured intensively by dredge or diving in the southeastern Black Sea, though there is still no domestic consumption in Turkey (Sağlam et al, 2009). But this fishery product of the veined rapa whelk is not consumed in Turkey, is exported to Asian countries such as Japan, south Korea and China (personal observation).

Commercial capture of veined rapa whelk has continued since early 1980s especially in the Black Sea. From 2005 to 2014, the average landing was  $9575.62 \pm 848.186$  tons, in the Turkish Seas (TUIK, 2016).

The biochemical parameters such as crude protein, crude lipid of finfish and shellfish are substantial and can be effected by different biotic and abiotic factors (Erdem and Bilgin, 2004, Bilgin et al, 2008). The differences of consumption of energy in different life stages especially in the reproduction period or seasons and different activities in different tissue of body effect the mainly the biochemical parameters.

In the present study, we investigated the effect of seasons in biochemical composition of the veined rapa whelk, *Rapana venosa* caught by beam trawl (Algarna) in the Black Sea.

## 2. MATERIAL AND METHODS

The veined rapa whelk, *Rapana venosa* (Valenciennes, 1846), samples were mostly obtained from commercial beam trawl known as algarna with its local name fishermen for biochemical analyses. Although commercial veined rapa whelk fishery with beam trawl is forbidden in the Turkish Black Sea coast between 1 May and 31 August (Anonymous, 2012), sampling surveys were conducted with a special permit for veined rapa whelk fishery for this research. The beam trawl with 3m maximum width of the mouth, 40 cm maximum depth of mouth, 1 m maximum cod-end length and 72 mm mesh size was used for sampling (Anonymous, 2012).

All samples were obtained from fishermen who fishing off Yakakent at Samsun province in the Black Sea between December 2014 and November 2015.

A total of 431 individual were analysed for crude oil (Erickson, 1993), dry matter (Mo and Nielsen, 1994), crude ash and crude protein (AOAC, 2000). 431 *R. venosa* meat were removed and dried in a oven individually. Then, dried meats were homogenised and these meats were used for crude protein, crude oil and crude ash analyzes. Seasons were grouped as winter (December-February), spring (March-May), summer (June-August), and autumn (September-November).

Experimental data were presented as mean  $\pm$  standard error (SE) and analyzed using one-way ANOVA followed by Tukey multiple range test to compare the means between the different experimental diet groups in PAST ver 1.75b software package (Hammer et al, 2001). Differences were considered statistically significant at  $P < 0.05$  levels.

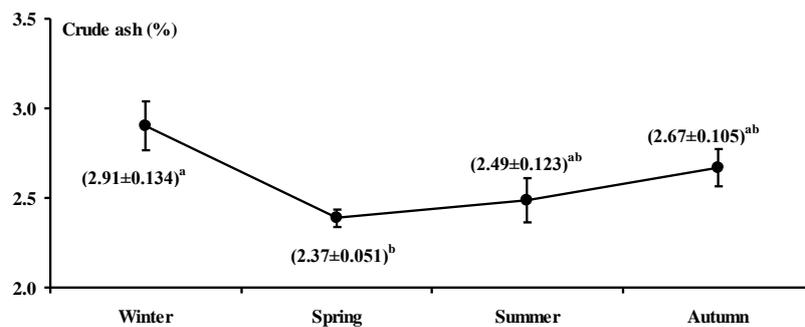
## 3. RESULTS

A total of 431 individual were analysed during the study. Monthly biochemical composition showed in Table 1. Seasonal variation of the results also showed in Fig. 1-4.

Mean crude ash values of whole meat for *R. venosa* was the highest value in winter ( $2.91 \pm 0.134\%$ ) and the lowest in spring ( $2.37 \pm 0.051\%$ ). The value of whole meat in winter was also statistically higher than spring ( $2.37 \pm 0.051\%$ ) ( $P < 0.05$ ). Moreover, the crude ash values was start to increase linearly from winter to autumn ( $2.67 \pm 0.105\%$ ) with a statistically insignificant increase ( $P > 0.05$ ) (Fig. 1).

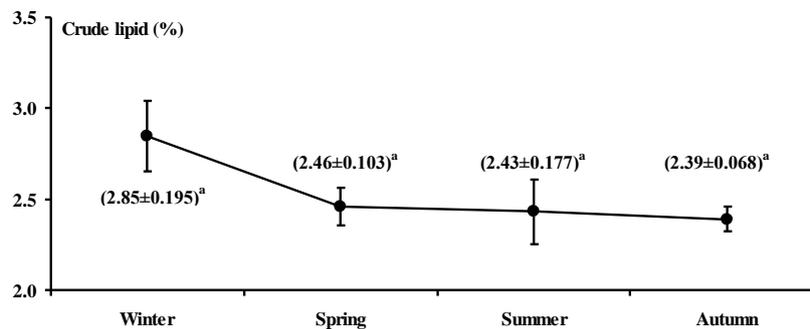
**Table 1.** Monthly variations in biochemical composition of the veined rapa whelk in the Black Sea. n: number of individual analysed.

| Year       | Month     | n          | Mean Biochemical composition (%) |                   |                    |                    |
|------------|-----------|------------|----------------------------------|-------------------|--------------------|--------------------|
|            |           |            | Crude ash                        | Crude lipid       | Crude protein      | Dry matter         |
| 2014       | December  | 50         | 2.67±0.185                       | 2.26±0.107        | 17.55±0.272        | 30.91±0.382        |
| 2015       | January   | 12         | 3.29±0.003                       | 3.17±0.172        | 21.22±0.022        | 36.30±1.993        |
|            | February  | 20         | 2.74±0.066                       | 3.12±0.081        | 16.73±0.072        | 29.41±0.432        |
|            | March     | 55         | 2.50±0.044                       | 2.72±0.230        | 18.86±0.022        | 31.48±0.330        |
|            | April     | 27         | 2.30±0.124                       | 2.31±0.054        | 16.78±0.219        | 27.86±0.329        |
|            | May       | 43         | 2.36±0.002                       | 2.34±0.044        | 17.74±0.072        | 29.47±0.557        |
|            | June      | 41         | 2.87±0.046                       | 2.97±0.031        | 19.72±0.259        | 32.37±0.562        |
|            | July      | 30         | 2.25±0.007                       | 2.05±0.010        | 15.96±0.092        | 26.15±0.655        |
|            | August    | 38         | 2.34±0.016                       | 2.27±0.057        | 19.17±0.288        | 33.44±0.649        |
|            | September | 50         | 2.73±0.029                       | 2.43±0.024        | 17.40±0.146        | 29.86±1.031        |
|            | October   | 18         | 2.40±0.014                       | 2.27±0.219        | 17.61±0.079        | 29.75±0.920        |
|            | November  | 47         | 2.88±0.201                       | 2.46±0.005        | 19.00±0.008        | 31.98±0.525        |
| <b>All</b> |           | <b>431</b> | <b>2.61±0.065</b>                | <b>2.53±0.078</b> | <b>18.14±0.298</b> | <b>30.71±0.217</b> |



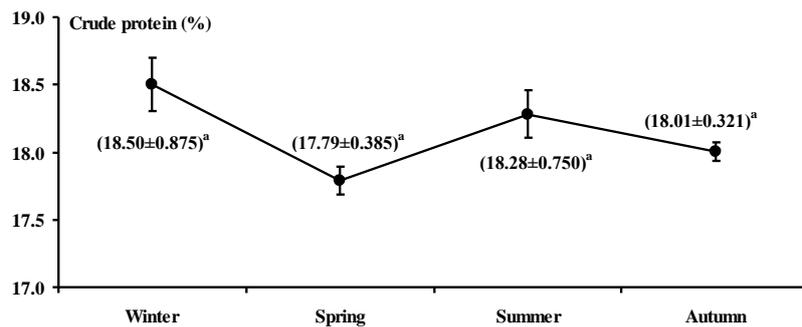
**Figure 1.** Seasonal crude ash variation of the veined rapa whelk in the Black Sea

Mean crude lipid values of whole meat for *R. venosa* was estimated as the highest value in winter (2.85±0.195) and showed a gradual decline until the autumn season (Fig. 2). The mean lipid values were not statistically difference among the seasons (P>0.05).



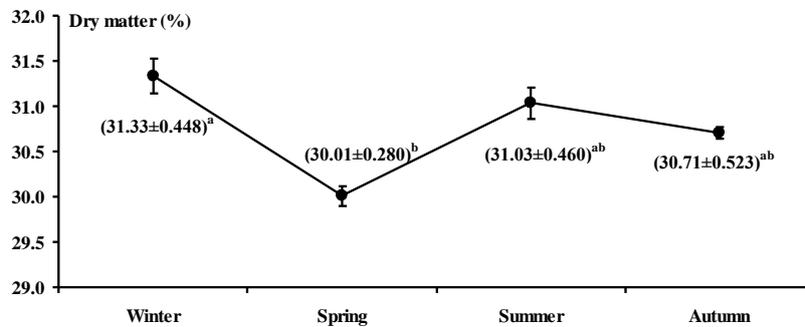
**Figure 2.** Seasonal crude oil variation of the veined rapa whelk in the Black Sea

Mean crude protein values of whole meat for *R. venosa* was the highest value in winter (18.50±0.875) and showed a fluctuation during the other seasons (Fig. 3). The mean crude values were not statistically difference among the seasons (P>0.05).



**Figure 3.** Seasonal crude protein variation of the veined rapa whelk in the Black Sea

Mean dry matter values of whole meat for *R. venosa* was the highest value in winter (31.33±0.448%) and the lowest in spring (30.01±0.280%) (Fig. 4). The value of whole meat in winter was also statistically higher than spring ( $P<0.05$ ).



**Figure 4.** Seasonal dry matter variation of the veined rapa whelk in the Black Sea

A previous study show that the crude protein, crude lipid, crude ash and dry matter of *R. venosa* was reported as 16.33%, 2.25%, 1.82% and 27.96%, respectively in the Black Sea (Düzgüneş et al, 1992). In the present study these values (see Table 1) was calculated as more or less similar with the results of the Düzgüneş et al (Düzgüneş et al, 1992). Crude ash, crude lipid, crude protein, and dry matter values were reported as 3.04%, 0.60%, 21.02% and 32.49, respectively by Çelik et al, (2014) in the Dardanelles at the Marmara Sea and 2.32±0.02%, 0.45±0.10%, 19.55±0.45% and 28.70±0.05%, respectively by Arslan (Arslan, 2009) in the Dardanelles at the Aegean Sea. There are some differences between the crude lipid values. Namely, our crude lipid values (2.53±0.078%) was rather higher than Çelik et al and Arslan (2009). But, our crude lipid value was similar with Düzgüneş et al (Düzgüneş et al., 1992). These patterns of variability of biochemical composition in *Rapana venosa* may be due to different geographical area, several environmental factors such as temperature, food availability, plankton composition and physiological factors and also reproduction activities during the reproductive season (Bi et al, 2016). For the Black Sea changes reproduction period of *R. venosa* was reported in summer season mainly between June and early August (Sağlam et al, 2009). Biochemical composition of rapana can be effected by sex (Bi et al, 2016) especially in the reproduction time.

#### 4. CONCLUSION AND DISCUSSION

A previous study show that the crude protein, crude lipid, crude ash and dry matter of *R. venosa* was reported as 16.33%, 2.25%, 1.82% and 27.96%, respectively in the Black Sea (Düzgüneş et al, 1992). In the present study these values (see Table 1) was calculated as more or less similar with the results of the Düzgüneş et al (Düzgüneş et al, 1992). Crude ash, crude lipid, crude protein, and dry matter values were reported as 3.04%, 0.60%, 21.02% and 32.49, respectively by Çelik et al, (2014) in the Dardanelles at the Marmara Sea and 2.32±0.02%, 0.45±0.10%, 19.55±0.45% and 28.70±0.05%, respectively by Arslan (Arslan, 2009) in the Dardanelles at the Aegean Sea. There are some differences between the crude lipid values. Namely, our crude lipid values (2.53±0.078%) was rather higher

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In conclusion, food availability, plankton composition, environmental factors factors especially temperature, reproduction period, sex and analysed organs such as gonad, digestive gland and mantle are the most important factors effect the biochemical composition of rapana. Thus, these factors should be taken account in the future studies.

### ACKNOWLEDGEMENTS

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