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**Research Article**

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# Investigation of Proximate and Fatty Acid Compositions of *Champsodon nudivittis*, A Discard Fish, from Northeastern Mediterranean

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**Abstract** *Champsodon nudivittis* a new fish species for the northeastern Mediterranean, Turkish coastal water. This new fish species, *Champsodon nudivittis*, is one of the discard fish which is not used for one of food items for people around the region. The aim of this current study is to investigate the proximate composition (lipid, moisture, and ash) and fatty acid composition of whole and fillets (without skin) of *Champsodon nudivittis*. The percentages of lipid, moisture, and ash of the whole fish and fillets were found to be 1.40 %-1.63 %, 76.46 %-80.61 %, and 2.25 %-1.64 %, respectively. The highest two fatty acids, Docosahexaenoic acid (DHA, C22:6n3) and palmitic acid (C16:0), were found to be 23.01%-27.02% and 19.88%-23.80% in whole and fillets of the fish respectively. Additionally, the levels of arachidonic acid (ARA, C20:4n6) in both whole and fillets was found to be higher than those of eicosapentaenoic acid (EPA). The whole and fillets without skin of the fish was found out low in lipid levels however the levels of DHA of this fish was found out high. Regarding its fatty acid composition, this fish can be a useful raw material item that could be used mainly in fish meal industry and other industrial branches.

**Keywords** proximate composition, lipid,fatty acid, *Champsodon nudivittis*

## Introduction

The *Champsodon nudivittis* is a new fish species for northeastern Mediterranean for Turkish coastal water part. Unlike other fish living in the same environment, this fish doesn't have a Turkish name in the region. The first report of the *Champsodon nudivittis* was on January in 2008 in northeastern Mediterranean Sea [1]. There were also other reports in the following years. The fish were seen, reported or studied in the Red Sea and off Ashdod [2], Finike Bay [3], the Gulf of Antalya [4], in north-eastern Mediterranean [5], off-shore the western coast of Rhodes Island [6], Ekincik Bay and Fethiye Bay [7], between Maden Island and Kucukkuyu, Edremit Bay in March and April 2014 [8] in the eastern Mediterranean [9].This fish species is considered as common fish species in Indo-West Pacific Ocean Indonesia, Madagascar, Papua New Guinea, Philippines and Australia [10-11].

Due the fact that it has rich contents (e.g., vitamins, proximate, fatty acids), fish and fish products are some of the important diet sources not only to humans but also animals in a variety of ways (e.g., raw material for pharmacy, cosmetics, fish oil, and fish feed). Anchovy is one of precious fish species caught in Black sea region in Turkey, generally abundant during catching seasons, and very cheap comparing other fish species. Along with other studies, studies of [12-15] about this species in this region during the catching seasons and in January [15] showed that this fish species very nutritious because of its protein, lipid, and fatty acid contents. A majority of anchovy is generally used for producing fish oil and fish meal. But this species is one of the affordable food item for a considerable amount of the lower income families. Using this fish species to food item for human healthy diet could be more beneficial and useful for humanity for promoting healthy lives. On the other hand, there should be found out alternative fish species to produce the fish meal and oil.

Proximate composition (protein, lipid, moisture, and ash) of fish is considered an important issue to consumers, scholars, and processers for many different reasons. The majority compositions of fish are generally known 16-21%

protein, 0.2-25%fat, 1.2-1.5% ash, and 66-81% moisture [16]. Knowing the composition of the fish may help to decide how to use it efficiently and effectively.

*Champsodon nudivittis* is considered as discarded fish species in the region by the fishermen and thrown back to the sea because its unpleasant sour tastein the Mediterranean. The fish are thrown back to sea. They are never been landed after trying to taste it a few times. In this study, proximate composition (moisture, ash, and lipid) and fatty acid composition of the fish were investigated in order to explore possibility of the being an alternative raw material to anchovy for producing fish meal, fish oil, and other possible usages.

## Material and Methods

### Materials

*Champsodon nudivittis* (Ogilby, 1895) were caught by gill net in January 2015 in Iskenderun Bay Northeastern Mediterranean/Turkey.

### Methods

Proximate (moisture, lipid, and ash contents) composition analyses were carried out according to AOCS (Anonymous, 1992) procedures after the body measurements. Fish lengths were measured with a ruler. Each fish specimens weighted with the precisions close to 0.01.

Moisture content was determined by drying samples at 105±2°C until a constant weight was obtained. Determination of crude lipid was performed by using a modified Bligh and Dyer method [17]. Total ash content was determined by samples at 550±10°C for 6 hours. All chemicals used were in analytical grade and obtained from Merck (Darmstadt, Germany) and SigmaAldrich (St. Louis, MO, USA).

GC MS (Gas Chromatography Mass Spectrophotometry) were used to determine the fatty acids. Fatty Acids Methyl Ester preparation, chromatographic conditions, and fatty acid determination were performed as described by Ozyilmaz (2016)[18].

Data regarding proximate compositions were subjected to analysis of variance (ANOVA) and mean comparison was carried out using Duncan's test. Significance was established at $P<0.05$.

## Results and Discussion

Proximate compositions of the whole and fillets (without skin) of the *Champsodon nudivittis*are given in Table 1.The total length and weight of the whole *Champsodon nudivittis* ranged from 8.3-13.1 cm and 5.42-16.2 g, respectively.The body measurements were in the range of previously reporting by Demirci et.al. [9] about the same species from the same region but fishing time was approximately three years ago from this current research.

The levels of lipid were calculated to be 1.40%, and 1.63% forwhole and fillets of the *Champsodon nudivittis*, respectively.According to Ackman's (1989)[19], fish grading regarding lipid levels, both whole and fillets of the *Champsodon nudivittis*in this present study can be considered as lean fish (lipid level lower than 2%). Additionally, the lipid levelsofwhole and fillets of the *Champsodon nudivittis* in this current study were found to be lower than those anchovy caught for during whole catching season, every individual month's specimens, [13-14] and in January [15].

**Table 1:** Proximate compositions of whole and fillets (without skin) of the *Champsodon nudivittis*

| | ***Champsodon nudivittis* (Whole)** | ***Champsodon nudivittis* (Fillet)** |
|---|---|---|
| Lipid (%) | $1.40\pm0.12^{a}$ | $1.63\pm0.07^{a}$ |
| Moisture (%) | $76.46\pm1.40^{a}$ | $80.61\pm1.97^{b}$ |
| Ash (%) | $2.25\pm0.27^{a}$ | $1.64\pm0.20^{b}$ |

Data represent means± standard deviation (n=3)

Mean± standard deviation followed by the different letters, with in a row, are significantly different (P<0.05).

The moisture levels of fillets of the *Champsodon nudivittis* was found to be higher than that of whole *Champsodon nudivittis.* The moisture contents of both whole and fillets (without skin) of the *Champsodon nudivittis* were found to be higher than that of anchovy during the whole catching seasons [13] and in January[15].

The ash contents of the fish in this current study differed from each other and these differences were found to be statistically significant ($P<0.05$).Compared to a previous study reported by Öksüz and Ozyilmaz (2010) [13] on previous study reported anchovy, the moisture contents measured for fillets and whole *Champsodon nudivittis* which were also caught in the winter in this present study were higher than that of anchovy caught in the winter and the other whole entire catching seasons.

The ash contents of the fillets and whole *Champsodon nudivittis* were differed from each other and this differentiation were found to be statistically significant (P<0.05). The ash contents were generally considered as

richness of the mineral contents in fish. In this situation, mineral compositions of the whole *Champsodon nudivittis* were supposed to be higher than that of the fillets of *Champsodon nudivittis*.

Fatty acid profiles (% of total fatty acids) of whole and fillets (without skin) of the *Champsodon nudivittis* were given in Table 2.The total amounts of the saturated fatty acids (SFA) and polyunsaturated fatty acids (PUFA) in lipid of the *Champsodon nudivittis's* fillets were found to be higher than those of in lipid of the whole *Champsodon nudivittis*. Comparing MUFA and PUFA monounsaturated fatty acids (MUFA) of the whole *Champsodon nudivittis* were found to be higher than that of *Champsodon nudivittis's* fillets.

The total levels of the n6 and n3 of the fillets of *Champsodon nudivittis* were found to be 11.75% and 34.06%, while those of whole *Champsodon nudivittis* were found to be 11.36% and 29.97%, respectively. Additionally, the n6/n3 and DHA/EPA ratios were found to be 0.35 and 5.68 forthe fillets of *Champsodon nudivittis* and 0.38 and 5.79 for the whole *Champsodon nudivittis*, respectively.

**Table 2:** Fatty acid profiles (% of total fatty acids) of whole and fillets (without skin) of the *Champsodon nudivittis*

| **Fatty acids** | **Fillets of *Champsodon nudivittis*** | **whole *Champsodon nudivittis*** |
|---|---|---|
| C14:0 | 2.35±0.20 | 2.80±0.27 |
| C15:0 | 0.43±0.01 | 0.57±0.04 |
| C16:0 | 23.80±0.46 | 19.88±0.51 |
| C17:0 | 0.95±0.04 | 1.12±0.03 |
| C18:0 | 7.95±0.13 | 8.57±0.08 |
| **∑SFA** | 35.47 | 32.94 |
| C15:1 | 0.83±0.04 | 1.24±0.06 |
| C16:1n9 | 1.30±0.02 | 1.50±0.02 |
| C17:1 | 0.64±0.03 | 1.22±0.04 |
| C18:1n9 | 10.71±0.31 | 13.06±0.06 |
| C20:1n9 | 0.38±0.03 | 0.43±0.03 |
| C22:1n9 | 0.38±0.04 | 0.39±0.05 |
| **∑MUFA** | 14.23 | 17.85 |
| C18:1n7 | 1.78±0.06 | 2.05±0.03 |
| C16:2n4 | 1.14±0.07 | 1.60±0.10 |
| C16:3n4 | 0.38±0.01 | 0.55±0.07 |
| C16:4n1 | 0.30±0.03 | 0.62±0.06 |
| C18:3n4 | 0.30±0.02 | 0.40±0.02 |
| C18:2n6 | 1.49±0.11 | 1.13±0.08 |
| C18:3n6 | 0.45±0.03 | 0.50±0.03 |
| C20:2n6 | 0.36±0.05 | 0.29±0.01 |
| C20:3n6 | 0.30±0.01 | 0.27±0.01 |
| C20:4n6 | 5.29±0.19 | 5.08±0.15 |
| C22:2n6 | 0.74±0.07 | 0.95±0.05 |
| C22:4n6 | 0.49±0.02 | 0.56±0.04 |
| C22:5n6 | 2.63±0.02 | 2.58±0.09 |
| C18:4n3 | 0.40±0.05 | 0.53±0.04 |
| C20:3n3 | 0.22±0.02 | 0.26±0.03 |
| C20:5n3 | 4.76±0.07 | 3.97±0.12 |
| C22:5n3 | 1.66±0.06 | 2.21±0.13 |
| C22:6n3 | 27.02±0.34 | 23.01±0.79 |
| **∑PUFA** | 49.71 | 46.55 |
| **∑n6** | 11.75 | 11.36 |
| **∑n3** | 34.06 | 29.97 |
| **n6/n3** | 0.35 | 0.38 |
| **DHA/EPA** | 5.68 | 5.79 |

Data represent means± standard deviation (n=3)

Among SFA, palmitic acid (C16:0) was the most abundant in both whole and fillets (without skin) of the *Champsodon nudivittis.* Stearic acid (C18:0) was the next most abundant in fillets and whole of the *Champsodon nudivittis*, at 7.95% and 8.57%, respectively. The C16:0 levels in SFA of the whole and fillets of the *Champsodon nudivittis* was found to be the second highest fatty acids after DHA levels in PUFA. The amounts of C16:0 in this

study for both whole and fillets of the *Champsodon nudivittis* were found to be higher than previously reported studies for anchovy [13-14]. Levels of C16:0 in whole *Champsodon nudivittis* were found to be very closer than a previously reported study for anchovy [15].

In MUFA contents, levels of C18:1n9 in both whole and fillets of the *Champsodon nudivittis* were found to be higher than a previously reported study for anchovy caught from Mediterranean in December [12] and lower than previously studies for anchovy from Black Sea in December [12], anchovy from Black Sea throughout October to April [13] and anchovy from Black Sea in March [15]. The amounts of C18:1n9 in whole *Champsodon nudivittis* were in agreement with a previous study reported by Tufan et al.(2011) [15] throughout September to April, except in March.

The levels of DHA in both whole and fillets of the *Champsodon nudivittis* were the highest fatty acids not only in PUFA but also all fatty acids identified in this current study. Additionally, both the amounts of DHA and EPA in fillets of the *Champsodon nudivittis* were found to be higher than that of whole *Champsodon nudivittis.* These two fatty acids are considered to be novel fatty acids due to their health benefits effects. Moreover, the levels of the ARA in both whole and fillets of the *Champsodon nudivittis* were found to be higher than those of EPA.

## Conclusion

Data of this article could help to understand some biochemical constituents of whole and fillets of the *Champsodon nudivittis* which is high in PUFA, moisture, and low in lipid which has novel fatty acids (e.g., DHA, ARA, and EPA).

## Recommendation

*Champsodon nudivittis* looks like anchovy regarding its body shape however its skin harder than anchovy. Even though it is very easy to fillet, debone, and even smash to anchovy, no easy to make those procedures to *Champsodon nudivittis* due to its harder skin. In this point of view, if *Champsodon nudivittis* is considered to process, one should keep in mind that separating its muscle could be difficult and would probably take time.

*Champsodon nudivittis* and all other by catch species which are thrown back to sea should be considered for alternative possible usage in order to explore the benefits that can be used to help to environment.

Extracting lipid from fish requires time, knowledge, and expenses. This fish species could be directly used to obtain low fat fish meal without extracting its lipid level either whole or fillets form.

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