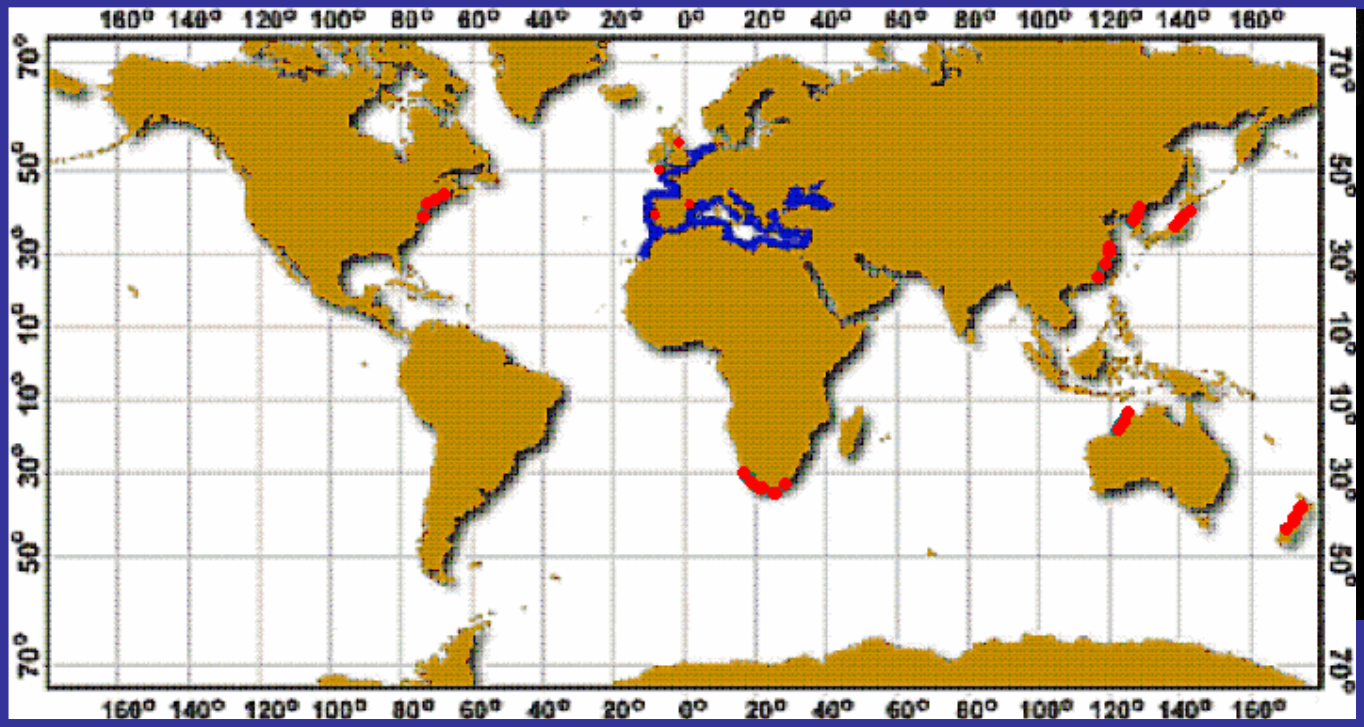
Comparison of Physico-Chemical Parameters and Composition of Wild and Suspended Cultured Mediterranean mussels (*Mytilus galloprovincialis*) from Sea of Marmara

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BACKGROUND

- *Mytilus galloprovincialis* is commonly known as the Mediterranean Mussel.
- It is native to the Mediterranean Sea and the Atlantic coast of southern Europe.
- It is introduced and widespread in Western North America, Asia, South Africa, and possibly elsewhere.





BACKGROUND

- Mussels are very important for marine ecology and for human diet, since they are an important source of nutrients.
- Consumption of these bivalve molluscs provides an inexpensive source of protein with a high biological value, essential minerals and vitamins.
- It is particularly rich in selenium, calcium, iron, magnesium, phosphorus and vitamins A, B1, B2, B6, B12 and C.







Production of Mussel

- ***Harvested wild mussels***

or

- ***Cultured mussels***



Cultured mussel are more healthful foods because their cultivation conditions are contain more control than wild stocks.



BACKGROUND

- According to the FAO, the annual world production of mussels is approximately 1,500,000 t. The 40% of this figure is produced in the EU (600,000 t), and in Spain approximately the half of the EU production.
- Mussels are the most representative mollusc on the Turkish bivalve market and an important resource in the Turkish fishing industry.
- According to the TUIK, the annual production of mussels is approximately 2,000 t. Actually, we think that this value is much more.





BACKGROUND

- The culture of marine molluscs are newly developing sector in Turkey.
- Today, production value of culture mussel in Turkey has reached approximately 650 t.
- There are a large number of studies on both wild and culture mussels from many countries that analyze composition, growth, reproduction, physiology or parasitology.

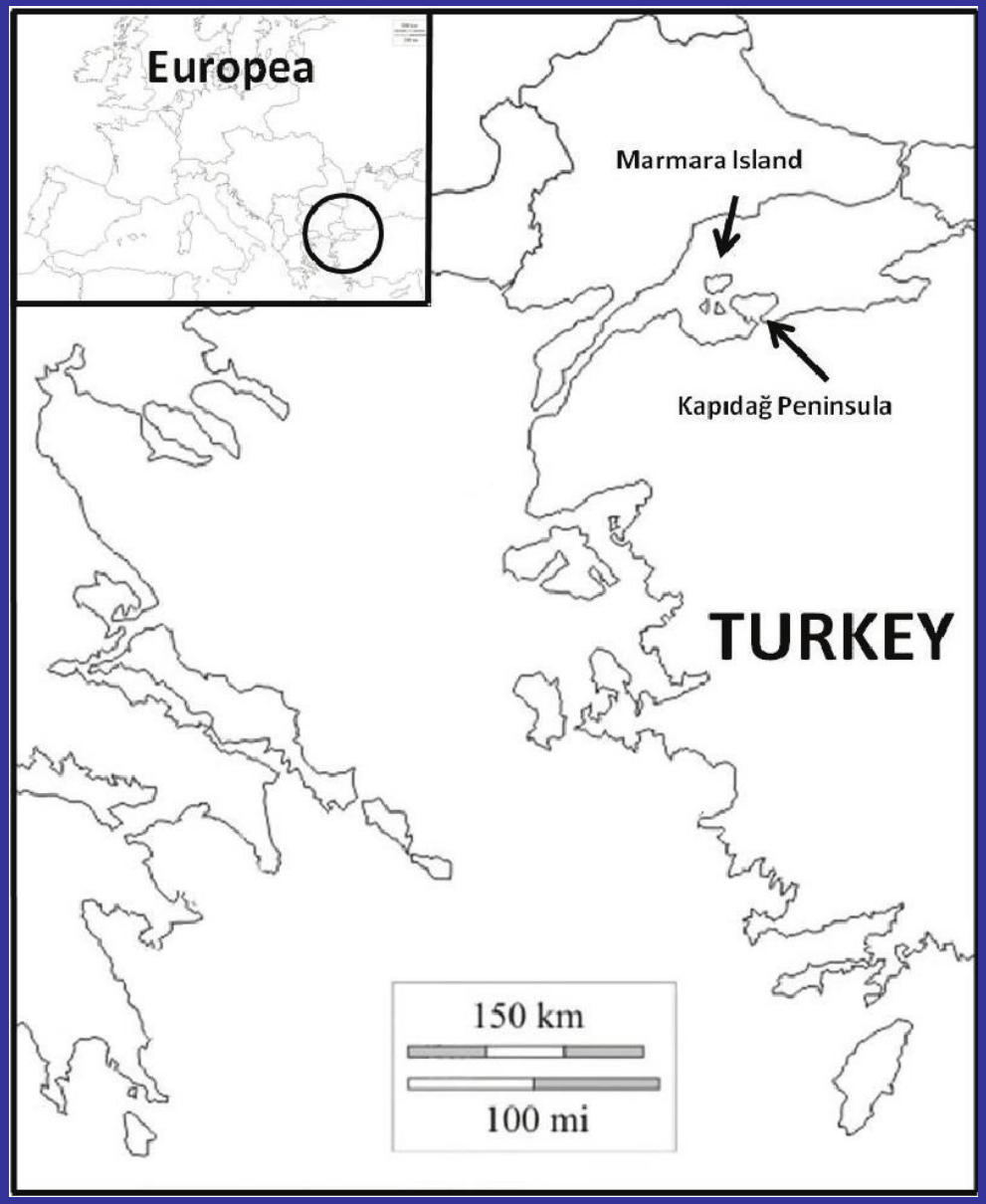


Major Goals

- To determine and comparasion biometric measurement (meat yield) and chemical parameters (proximate composition, fatty acid composition and amino asit content) of wild and suspended cultured Mediterranean mussels (*Mytilus galloprovincialis*) from Sea of Marmara.

Materials

- Mediterranean mussels were cultured by mussel farm in the Marmara Island.
- Wild mussels obtained from the Sea of Marmara.
- Totally 100 individual used for analyses.
- Both group was collected autumn season.



Biometrics measurement and meat yield

- Length (maximum measure along the anterior-posterior axis), width (maximum lateral axis), and height (maximum dorsoventral axis) of mussels, were measured using a 0.05 mm precision calliper.
- Meat yield, an important aspect of marketability of mussels, was calculated as follows: (wet meat weight/whole mussel weight) x100

Proximate composition;

Moisture	→	AOAC (2000)
Protein	→	AOAC (2000)
Lipid	→	Bligh & Dyer (1959)
Ash	→	AOAC (2000)

Amino Acid Composition

- Mussel samples were hydrolyzed at 110°C for 24 h with 6.0 mol/L HCl
- The hydrolysates of all samples were filtered through a 0.20 μm PTFE syringe filter
- And then all the HCl in the hydrolysates was evaporated.
- After evaporation of HCl, all the hydrolysates samples were dissolved in citrate–sodium buffer (0.1 mol/L, pH 2.2)
- The levels of amino acids were measured in mussel samples using EZ:faast kits (EZ:faast GC/FID Protein Hydrolysate Amino Acid Kit) by gas chromatography according to Badawy, Morgan, and Turner (2008).

Fatty acid composition;

- Fatty acid methyl esters (FAMEs) were prepared using standard method of International Union of Pure and Applied Chemistry (1979)
- The GC–MS analysis for FAMEs was performed on Thermo Finnigan Trace GC coupled with a Multiplier Quadrupole Mass Selective Detector (GC–MS DSQ) and a Thermo auto sampler AI 3000 injector (Thermo Electron Corporation, Milan, Italy) and operated with Xcalibur Home Page version 1.4 SR1 Software.

Statistical analysis

- The comparison of wild and cultured mussel data was evaluated by repeated measures analysis of variance (ANOVA).
- Tukey HSD post hoc test was used for multiple comparisons of observed means.
- The software used was PASW Statistics 18 for Windows (IBM, SPSS Inc., Chicago, IL).

RESULTS

Origin	Wild	Culture	α
Biometric measurements [Y]			
Length (mm)	56.8 (6.9)[b]	63.3 (6.1)[a]	***
Width (mm)	29.8 (3.6)[b]	33.9 (6.8)[a]	***
Height (mm)	20.3 (3.7)[b]	22.6 (2.2)[a]	***
Meat yield (%)	50.0 (7.8)[a]	53.4 (5.9)[a]	ns
Proximate composition [Z]			
Moisture (g/100 g)	85.2 (0.5)[a]	82.4 (0.7)[b]	**
Ash (g/100 g)	2.3 (0.1)[a]	2.5 (0.1)[a]	ns
Fat (g/100 g)	1.5 (0.1)[b]	2.1 (0.1)[a]	**
Protein (g/100 g)	10.6 (0.9)[a]	12.5 (1.0)[a]	ns

Numbers in parentheses represent standard deviation. Means followed by the same letter within the same row are not significantly different, and different letters indicate significant differences.

ns, non significant; *p < 0.05; **p< 0.01; ***p< 0.001

[Y] Mean from 100 measurements.

[Z] Mean from three analyses.

Essential Amino Acids (g/100g)	Wild	Culture	α
Histidin (His)	0.48 (0.07)^{a}	0.30 (0.02)^{b}	*
Isoleucine (Ile)	0.65 (0.06)^{a}	0.41 (0.02)^{b}	**
Leucine (Leu)	0.84 (0.03)^{a}	0.87 (0.03)^{a}	ns
Lysine (Lys)	1.09 (0.05)^{a}	0.91 (0.03)^{b}	**
Methionine (Met)	0.39 (0.03)^{b}	0.55 (0.01)^{a}	***
Phenylalanine (Phe)	0.94 (0.07)^{a}	0.39 (0.01)^{b}	***
Tryptophan (Trp)	0.44 (0.03)^{a}	0.45 (0.05)^{a}	ns
Threonine (Thr)	0.49 (0.04)^{a}	0.17 (0.01)^{b}	***
Valine (Val)	0.55 (0.02)^{b}	0.74 (0.04)^{a}	**
Total Essential Amino Acids	5.87 (0.28)^{a}	4.80 (0.09)^{b}	**

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Nonessential Amino Acids (g/100g)	Wild	Culture	α
Aspartic Acid (Asp) + Asparagine (Asn)	1.29 (0.03)^{b}	1.56 (0.02)^{a}	***
Alanine (Ala)	0.83 (0.06)^{a}	0.46 (0.03)^{b}	***
Arginine (Arg)	0.73 (0.03)^{a}	0.58 (0.02)^{b}	**
Cystine (Cys)	0.45 (0.03)^{a}	0.27 (0.01)^{b}	***
Glutamic Acid (Glu) + Glutamine (Gln)	2.35 (0.04)^{a}	1.86 (0.02)^{b}	***
Glycine (Gly)	0.84 (0.04)^{b}	1.31 (0.03)^{a}	***
Hydroxyproline (Hyp)	0.22 (0.02)^{b}	1.02 (0.02)^{a}	***
Taurine (Tau)	0.26 (0.01)^{b}	0.37 (0.01)^{a}	***
Serine (Ser)	0.71 (0.01)^{a}	0.26 (0.02)^{b}	***
Tyrosine (Tyr)	0.35 (0.03)^{b}	0.65 (0.01)^{a}	***
Proline (Pro)	0.46 (0.03)^{a}	0.29 (0.01)^{b}	***
Ornithine (Orn)	0.11 (0.01)^{b}	0.19 (0.01)^{a}	*
Total Non-essential amino acids	8.61 (0.18)^{a}	8.83 (0.14)^{a}	ns
Total Amino Acids	14.48 (0.44)^{a}	13.63 (0.22)^{b}	*
EAA/NEAA	0.68^{a}	0.54^{b}	***

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Fatty Acid (%)	Wild	Culture	α
C16:0	15.32 (1.40)^{b}	18.94 (0.89)^{a}	*
C18:0	5.17 (0.08)^{b}	6.71 (0.20)^{a}	***
∑SFA	25.56 (1.41)^{b}	31.81 (1.09)^{a}	**
C16:1	5.24 (0.06)^{b}	6.74 (0.11)^{a}	***
C18:1n–9c	3.26 (0.04)^{b}	4.15 (0.19)^{a}	**
C20:1n–9	2.33 (0.04)^{b}	3.24 (0.06)^{a}	***
∑MUFA	13.32 (0.05)^{a}	17.46 (0.08)^{b}	***
C18:2n–6c	4.12 (0.04)^{a}	3.89 (0.05)^{b}	**
C22:2	7.54 (0.10)^{a}	5.74 (0.05)^{b}	***
C18:3n–3	3.16 (0.02)^{a}	1.54 (0.01)^{b}	***
C20:4n–6	3.71 (0.08)^{a}	2.19 (0.06)^{b}	***
C20:5n–3	15.38 (0.12)^{a}	13.74 (0.24)^{b}	***
C22:6n–3	23.62 (0.63)^{a}	20.86 (0.95)^{b}	*
∑PUFA	61.12 (0.91)^{a}	50.73 (1.10)^{b}	***
∑n–3	42.16 (0.77)^{a}	36.14 (1.17)^{b}	**
∑n–6	7.83 (0.11)^{a}	6.08 (0.06)^{b}	***
n–3:n–6	5.38^{b}	5.94^{a}	*

Numbers in parentheses represent standard deviation. Means followed by the same letter within the same row are not significantly different, and different letters indicate significant differences.

*p < 0.05; **p< 0.01; ***p< 0.001

CONCLUSION

- Willd mussels have richer nutrition composition
- However the cultured mussels have quote better nutrition value comparing to the many seafood.
- There may be many reasons especially related with marine environment for the differences in analyzed value in between wild and cultured mussel.
- These results provide valuable information for the sector especially for producers cultured mussel.

Thank you for your attention

