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# FEATURES OF LIPID ACCUMULATION IN STRIPED VENUS CLAM *CHAMELEA GALLINA* IN THE SUBLITTORAL ZONE OF THE CRIMEAN COAST (BLACK SEA)

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## *ABSTRACT*

*Seasonal lipid studies in shellfish are critical for assessment of metabolic lipid profiles and body condition. The aim of this study was to investigate the seasonal patterns of total lipid accumulation, identify the lipid classes, and determine the fatty acid composition of the striped venus clam* Chamelea gallina *from the sublittoral zone along the Crimean coast of the Black Sea. The highest levels of total lipids (TLs), including triacylglycerols (storage lipids), were observed during the winter–spring period, during which the fatty acid (FA) composition consisted of 23 species. The FA composition of* C. gallina *from the Crimean coast differed from that of populations in other regions of the World Ocean. The results can be used for a comprehensive assessment of environmental impacts on organisms in biomonitoring research and for evaluating the potential nutritional value of these clams.*

**Key words:** Venus clam, *Chamelea gallina*, Black Sea, lipids, fatty acids, seasonality

# CARATTERISTICHE DELL'ACCUMULO DI LIPIDI NELLA VONGOLA LUPINO *CHAMELEA GALLINA* NELLA ZONA SUBLITORALE DELLA COSTA CRIMESE (MAR NERO)

## *SINTESI*

*Gli studi stagionali sui lipidi nei molluschi sono fondamentali per valutare i profili metabolici dei lipidi e le condizioni fisiche. Lo scopo di questo studio era quello di indagare i modelli stagionali di accumulo di lipidi totali, identificare le classi di lipidi e determinare la composizione degli acidi grassi della vongola lupino* Chamelea gallina *proveniente dalla zona sublitorale lungo la costa crimeana del Mar Nero. I livelli più elevati di lipidi totali (TL), compresi i triacilgliceroli (lipidi di riserva), sono stati osservati durante il periodo invernale-primaverile, durante il quale la composizione degli acidi grassi (FA) era costituita da 23 specie. La composizione degli acidi grassi di* C. gallina *lungo la costa della Crimea differiva da quella delle popolazioni di altre regioni degli oceani. I risultati possono essere utilizzati per una valutazione completa dell'impatto ambientale sugli organismi nella ricerca di biomonitoraggio e per valutare il potenziale valore nutrizionale di queste vongole.*

**Parole chiave:** vongola lupino, *Chamelea gallina*, Mar Nero, lipidi, acidi grassi, stagionalità

## INTRODUCTION

The striped venus clam, *Chamelea gallina* (Linnaeus, 1758), a marine bivalve mollusk of the family Veneridae, is widely distributed in the Mediterranean Sea, Adriatic Sea, Black Sea, and along the eastern Atlantic coasts of Europe (Öztürk & Altinok, 2021). In the Black Sea, although comparable to commercially harvested species in abundance and biomass, these clams remain understudied and unexploited (Panayotova *et al*., 2020; Merdzhanova *et al*., 2021). Lipids and fatty acids (FAs) are not only indicators of nutritional value but also crucial for ecological monitoring. The lipid composition of bivalves varies depending on geographical distribution (Ricardo *et al*., 2017). For instance, differences in total lipids (TLs) and FA composition have been observed between *C. gallina* from the western Black Sea (Bulgaria) (Merdzhanova *et al*., 2021) and the Adriatic Sea (Orban *et al*., 2007). Similarly, variations exist between specimens from the Marmara Sea (Türkiye) (Colakoglu *et al*., 2011) and the western Black Sea (Bulgaria) (Merdzhanova *et al*., 2021).

Lipid composition is influenced by adaptive processes in animals, a phenomenon extensively documented in the literature (Hochachka & Somero, 2002). Lipids in mollusks respond to habitat changes, abiotic factors (e.g., salinity, temperature, recreational pressure, anoxia), and other stressors (Hochachka & Somero, 1971; Fokina *et al*., 2018, Fokina & Chesnokova, 2021). Under stress, physicochemical modifications of cell membranes—primarily involving phospholipids and cholesterol (structural lipids)—occur to maintain optimal viscosity. During temperature drops, often accompanied by anoxia (e.g., during low tides), mollusks utilize triacylglycerols as an alternative energy source (Fokina *et al*., 2018, Fokina & Chesnokova, 2021).

Sublittoral mollusks face greater abiotic stress, resulting in lipid profiles that are distinct from those of deeper-water counterparts or individuals from other oceanic regions. This study aimed to investigate TLs and major lipid classes – phospholipids (PLs), monoacylglycerols (MGs), diacylglycerols + sterols (DGs+st), free fatty acids (FFAs), and triacylglycerols (TAGs) – in *C. gallina* from the sublittoral zone of Sevastopol Bay (Black Sea) over an annual cycle, with a particular focus on FA composition in spring, a period of favorable feeding conditions.

## MATERIAL AND METHODS

### Study Object, Sample Collection, and Processing

Specimens of *Chamelea gallina* were collected monthly from December to May and September to December 2021–2022 from three stations in the sublittoral zone of Kazachya Bay, Sevastopol (Fig. 1). The sediment was sandy-silt sediment. The sampling regime covered the winter, spring, and autumn seasons; summer was excluded due to high temperatures, which compromised lipid stability during sample transport, reducing the accuracy of lipid determination. Each month, 5–7 adult clams (shell length 15–25 mm) were collected and their soft tissues pooled for analysis.


***Fig. 1: Map of sampling in Kazachya Bay.***
***Sl. 1: Zemljevid obravnavanega območja.***

### Total Lipids and Thin-Layer Chromatography (TLC)

TLs were extracted using the Folch method (Folch *et al*., 1957). Lipid classes—including PLs (phospholipids), MGs (monoacylglycerols), DGs+st

(diacylglycerols + sterols), FFAs (free fatty acids), and TAGs (triacylglycerols)—were separated via two-dimensional TLC using the "chamber-in-chamber" principle (Borodina *et al*., 2023). This technique employs a solvent polarity gradient for fractionation, utilizing a three-solvent system: Chamber 1: Chloroform; Chamber 2: Hexane: diethyl ether (9:1, v/v); Chamber 3: n-hexane. The Sorbfil Plates ПТСХ-АФ-А (Krasnodar, Russia) were used as the stationary phase. Prior to analysis, the plates were washed with ethyl acetate and activated with an alcoholic solution of phosphomolybdic acid (PMA).

### Quantification of Lipid Fractions

Separated lipid bands were quantified densitometrically using an HP Scanjet 200 scanner. Acquired images (in JPEG format) were processed using TLC Manager 4.0.2.3D software for peak integration and quantitative analysis.

### Preparation of Fatty Acid Methyl Esters (FAMEs)

Total lipid extracts were subjected to derivatization (Chen *et al*., 2023; Juarez *et al*., 2008) prior to analysis. The lipid extract was dissolved in a mixture of 180 µL dimethyl sulfoxide (DMSO; CAS 67-68-5, Panreac) and 20 µL of 25% methanolic tetramethylammonium hydroxide (TMAH; CAS 75-59-2, Sigma-Aldrich), then vortexed for 2 min. Subsequently, 30 µL of iodomethane (CAS 74-88-4, Sigma-Aldrich) was added for methylation.

The reaction mixture was incubated at room temperature for 20 min, after which n-hexane (CAS 110-54-3, Panreac) was added for liquid-liquid extraction. The mixture was vigorously agitated for 5 min using a PE-6300 laboratory shaker. The organic phase was then separated by centrifugation (10,000 RPM) using a Microspin FV-2400 vortex centrifuge. The hexane layer, containing fatty acid methyl esters (FAMEs), was carefully transferred to a gas chromatography vial for subsequent analysis.

### Gas Chromatography-Mass Spectrometry (GC/MS)

The chromatographic-mass spectrometric analysis was performed at the Scientific Research Laboratory "Molecular and Cellular Biophysics" of Sevastopol State University using a Chromatec-Crystal 5000 GC/MS system equipped with a mass spectrometric detector.

Chromatographic conditions: injection volume: 1 µL; column: HP-5MS UI capillary column (Agilent; 30 m × 0.25 mm ID, 0.25 µm film thickness) containing (5%-phenyl)-methylpolysiloxane stationary phase; carrier gas: grade 6.0 helium at a constant flow rate of 1 mL/min; temperature program: initial temperature: 80°C (held for 2 min), ramp rate: 5°C/min to 280°C; injector: temperature: 280°C, split ratio: 20:1. Mass spectrometric conditions: ionization mode: electron impact (EI) at 70 eV; ion source temperature: 230°C; transfer line temperature: 280°C; mass range: 30–650 m/z. Data processing: The acquired data were processed using Chromatec Analytic 3.1 software (version 3.1.2211.3).

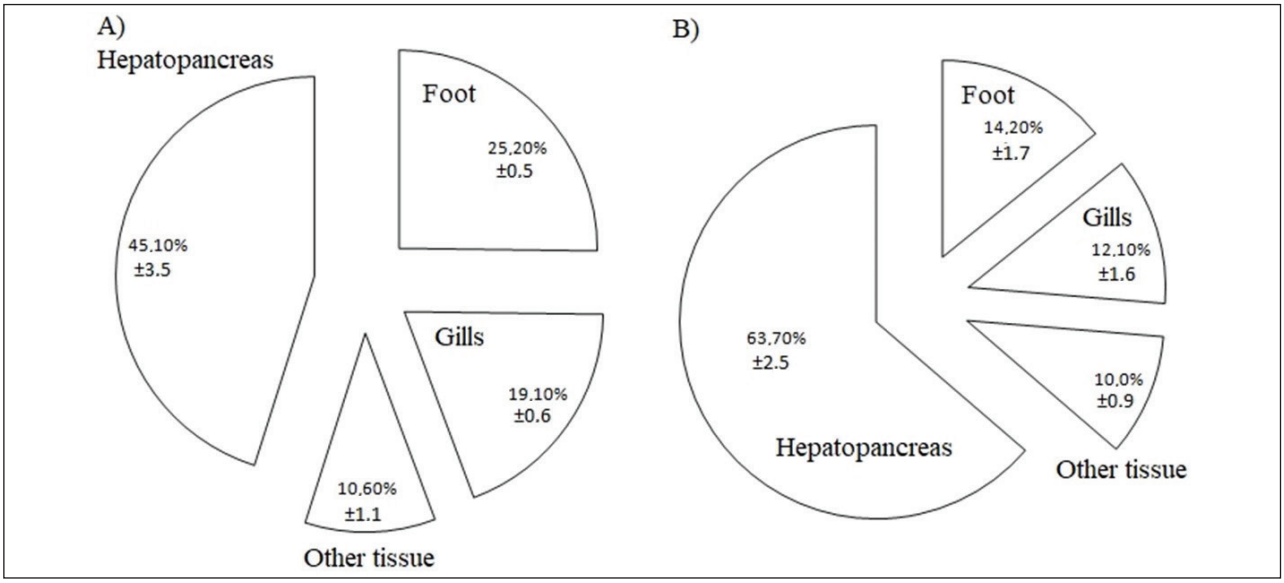


***Fig. 2: A) Organ mass distribution in** C. gallina **individuals; B) Total lipid (TL) content in** C. gallina**.***
***Sl. 2: Porazdelitev mase organov pri primerkih vrste** C. gallina**; B) celokupna vsebnost lipidov (TL) pri primerkih vrste** C. gallina**.***

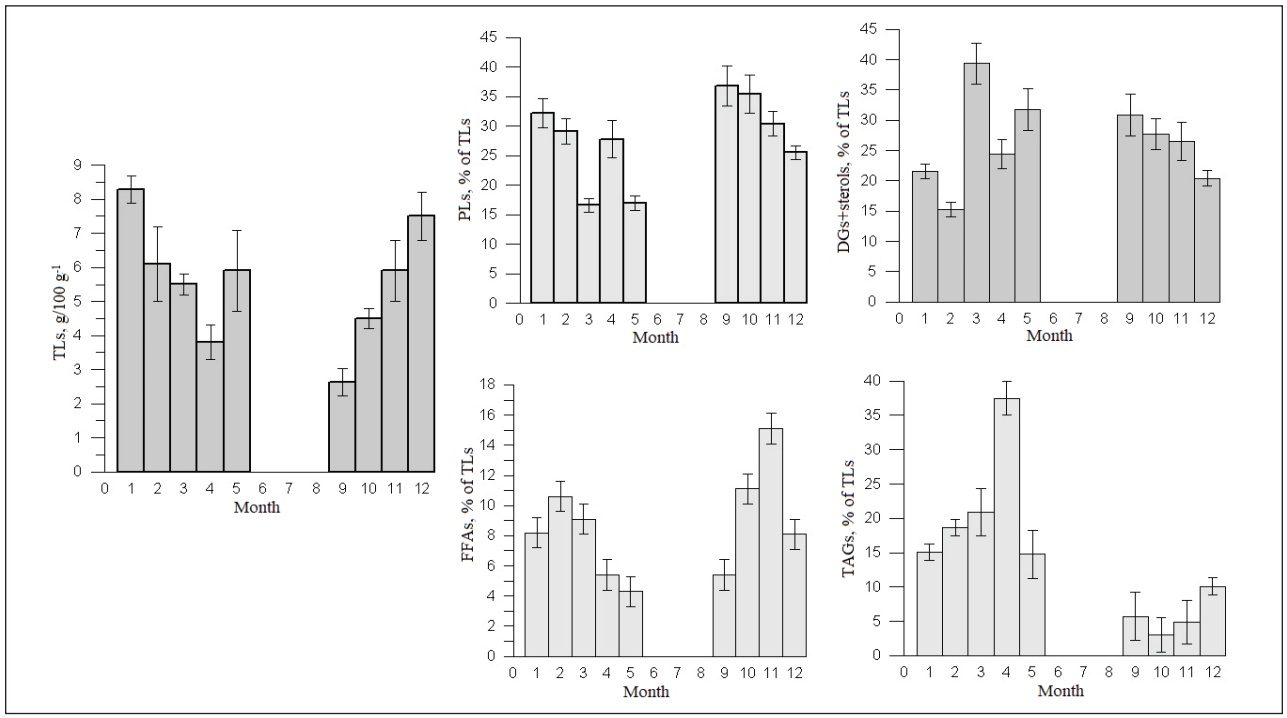


***Fig. 3: Dynamics of TL and lipid classes – PLs, DGs+st, FFAs, and TAGs – in tissues of*** *C. gallina* ***clams in different periods of the annual cycle.***
***Sl. 3: Dinamika celokupnih lipidov in razredi lipidov – PLs, DGs+st, FFAs, in TAGs – v tkivih primerkov školjk*** *C. gallina* ***v različnih periodah letnega cikla.***

Compound identification was performed using NIST MS Search v.3.0 against the NIST 2023 mass spectral library (database updated April 18, 2023).

### Quantification and Statistical Analysis

Lipid fractions were quantified as percentages of total lipids (% TLs) for: PLs (phospholipids), DGs+St (diacylglycerols + sterols), FFAs (free fatty acids), and TAGs (triacylglycerols). All data are presented as mean ± standard error of mean (M±SEM). Significance threshold was established at $p \leq 0.05$. FA composition data were analyzed using the Mann-Whitney U-test (for non-parametric comparison).

## RESULTS

### Lipid Distribution and Seasonal Dynamics in *C. gallina*

*Tissue-Specific Lipid Distribution (Early Winter)*

At the beginning of winter, the distribution of total lipids across mollusk tissues was analyzed in relation to the organ mass-size characteristics (Fig. 2). The hepatopancreas emerged as the primary lipid reservoir, accounting for >50% of TL, which underscores its metabolic centrality in energy storage and mobilization.

*Seasonal Dynamics of Lipids in Mollusks*

Analysis of pooled tissues demonstrated marked seasonal fluctuations in TL content (Fig. 3). The highest lipid concentrations were observed during winter (6.1–8.3 g/100 g wet wt), with a secondary, more modest peak occurring in late spring (May: 5.9 g/100 g wet wt). During other sampling months, TL content fluctuated between 2.6–5.5 g per 100 g of wet tissue weight (wet wt).

The accumulation of major lipid classes—PLs, DGs+st, FFAs, and TAGs—exhibited distinct seasonal trends. Structural lipids, particularly PLs and sterols, dominated the TL pool throughout the year, accounting for 44.3% to 67.7% of TLs (in February and September, respectively), with an annual mean of 54.3 ± 2.56%.

Storage lipids (predominantly TAGs) showed a different pattern: peak accumulation: 37.5 ± 2.41% of TLs occurred in April, coinciding with plankton blooms and diversified food availability, while minimum levels (3.0 ± 0.50% of TLs) were recorded in October (autumn). The combined contribution of cholesterol (21.14 ± 1.06%) and PLs to TLs was comparable to TAG accumulation levels in April (Fig. 3, Tab. 1). This equilibrium between structural (PL+st) and storage (TAG) lipids suggests an active membrane maintenance despite seasonal resource shifts. Therefore, the FA study was conducted during the winter–spring period.

***Tab. 1: Winter–spring FA and sterol composition in** C. gallina**. *Retention time - This is the time required for the substance to pass through the column (from the injector to the detector). Corresponds to the time when the peak maximum appears on the chromatogram. **Peak area, (% of the total) - his is the percentage of a given substance, which is calculated by determining the area of the corresponding peak as a percentage of the total area of all peaks detected in the sample. In this case, unmarked peaks corresponding to solvents, reagents, impurities, as well as the mobile phase or matrix of the sample are not taken into account.***
***Tab. 1: Zimsko-pomladna sestava maščobnih kislin in sterolov v** C. gallina**. *Retencijski čas - To je čas, ki je potreben, da snov preide skozi kolono (od injektorja do detektorja). Ustreza času, ko se na kromatogramu pojavi maksimum vrha. **Površina vrha (% od celotne površine) - To je odstotek dane snovi, ki se izračuna tako, da se površina ustreznega vrha določi kot odstotek celotne površine vseh vrhov, zaznanih v vzorcu. V tem primeru se ne upoštevajo neoznačeni vrhovi, ki ustrezajo topilom, reagentom, nečistočam, kot tudi mobilna faza ali matrica vzorca.***

| № | Lipid formula | Retention time* (min) | Peak area** (% of the total) |
|---|---|---|---|
| 1 | 11:0 | 7.426 | 0.146±0.007 |
| 2 | 12:0 | 8.064 | 0.894±0.045 |
| 3 | iso-14:0 | 9.028 | 0.400±0.020 |
| 4 | 14:0 | 9.232 | 3.433±0.172 |
| 5 | 4,8,12-tri-Me 13:0 | 9.512 | 1.140±0.057 |
| 6 | anteiso-15:0 | 9.583 | 0.127±0.006 |
| 7 | 15:0 | 9.773 | 1.644±0.082 |
| 8 | iso-16:0 | 10.103 | 1.216±0.061 |
| 9 | 16:0 | 10.289 | 21.459±1.073 |
| 10 | iso-17:0 | 10.601 | 1.831±0.092 |
| 11 | anteiso-17:0 | 10.648 | 1.423±0.071 |
| 12 | 17:0 | 10.780 | 1.972±0.099 |
| 13 | 18:0 | 11.250 | 7.923±0.396 |
| | ΣSFAs | | 43.608±2.180 |
| 14 | 16:1ω-5 | 10.200 | 2.258±0.113 |
| 15 | 18:1ω-9t | 11.149 | 7.044±0.352 |
| 16 | 18:1ω-9c | 11.174 | 3.556±0.178 |
| 17 | 20:1ω-7 | 12.045 | 2.600±0.130 |
| 18 | 20:1ω-9 | 12.070 | 2.218±0.111 |
| | ΣMUFAs | | 17.676±0.884 |
| 19 | 18:2ω-6 | 11.131 | 1.178±0.059 |
| 20 | 20:4ω-6 | 11.891 | 3.275±0.164 |
| 21 | 20:5ω-3 | 11.927 | 2.415±0.121 |
| 22 | 22:6ω-3 | 12.794 | 1.901±0.095 |
| | ΣPUFAs | | 8.769±0.438 |
| 23 | 22:4ω-6,9,12,18 | 12.801 | 2.346±0.117 |
| | ΣNMIFAs | | 2.346±0.117 |
| 24 | 22-Dehydrocholesterol | 18.700 | 1.707±0.085 |
| 25 | Cholesterol | 19.313 | 21.136±1.057 |
| 26 | Brassicasterol | 20.101 | 4.758±0.238 |
| | ΣSterols | | 27.601±1.380 |

### FA Composition

In the winter–spring samples (collected from February through March), a total of 23 FAs and 3 sterols were detected (Tab. 1). In total, 13 saturated fatty acids (SFAs) were identified, with the major contributors—together comprising over one-third of all FAs)—being 16:0 (21.5%), 18:0 (7.9%), and 14:0 (3.4%). Five monounsaturated FAs (MUFAs) were identified, collectively accounting for less than one-fifth of total FAs. Among the MUFAs, the ω-9 FAs were of particular interest: 18:1ω-9c (3.6%) and 20:1ω-9 (2.2%), as well as the ω-7 FA 20:1ω-7 (2.6%). Four polyunsaturated FAs (PUFAs) were present, with the highest contributions from 20:4ω-6 (3.3%) and 20:5ω-3 (2.4%). Notably, one non-methylene-interrupted fatty acid (NMI FA)—22:4ω-6,9,12,18—was detected in appreciable quantity (2.4%). Quantitatively, PUFAs constituted one-tenth of the total FA and sterol content. Among the sterols, cholesterol was the most abundant (21.1%), with smaller quantities of 22-dehydrocholesterol (1.7%) and brassicasterol (4.8%) also detected and identified.

## DISCUSSION

The primary factors governing the seasonal dynamics of lipid composition in bivalve mollusks include water temperature, salinity, food resource availability and quality, as well as reproductive cycle stages (Hochachka & Somero, 1971; Fokina *et al.*, 2018). Of particular interest is the adaptation of mollusks inhabiting the sublittoral zone, where they experience significant fluctuations in temperature, salinity, and periodic hypoxia induced by wave action during low tides. Biochemical adaptation mechanisms to such conditions are primarily mediated through lipid metabolism (Hochachka & Somero, 1971; Fokina *et al.*, 2018). PLs, cholesterol, SFAs, and PUFAs play pivotal roles in this process, as the primary response to environmental stressors involves modification of the cell membrane structure, whose main component is the lipid bilayer (Fokina *et al.*, 2018). One of the most significant adaptive mechanisms is homeoviscous adaptation, which maintains optimal membrane fluidity (Hochachka & Somero, 2002). This process entails remodeling of the membrane lipid composition, including adjustments to the cholesterol-to-phospholipid ratio and modifications of the fatty acid profile within phospholipids (Fokina *et al.*, 2018).

In *C. gallina*, seasonal variations in total lipid (TL) content demonstrate a predominance of structural lipids (PLs and cholesterol) consistent with this adaptation mechanism. The reduction in TAGs (storage lipids) can be explained not only by adaptive responses to peak coastal temperatures, anthropogenic pressure, and hypoxia events, but also by active reproductive phases. In bivalves (Bivalvia), storage lipids are primarily accumulated in the gonads; thus, their significant decrease during autumn–winter coincides with completion of the reproductive cycle (Fokina *et al.*, 2018). Against the background of PL dynamics (the quantitatively dominant structural lipid class), increased storage lipids may indicate either greater food diversity or reduced metabolic expenditure. As shown in Fig. 3, TAG accumulation begins in late winter with increasing daylight and gradual warming of coastal waters. During the winter–spring period, a natural reduction in coastal anthropogenic pressure occurs alongside phytoplankton succession, which enriches the dietary spectrum for filter-feeding mollusks. Concurrently, the onset of the reproductive cycle involves active TAG accumulation in generative tissues. The combined effect of these factors likely explains the comparable proportions of structural and storage lipids observed in *C. gallina* in April, though TL content did not peak during this period. Maximum TL values occurred in winter, coinciding with dormancy and tissue restoration. A distinct TL peak in May tissues likely reflects spring dietary diversification. Our prior research on seasonal carotenoid dynamics supports this: significant carotenoid ester accumulation in spring months (Borodina *et al.*, 2021) indicates diverse food resources. The amplitude of seasonal TL fluctuations in *C. gallina* populations from the Crimean coast was 1.5–3.5 times greater than in specimens from the Mediterranean and the Bulgarian Black Sea (Orban *et al.*, 2007; Panayotova *et al.*, 2020; Merdzhanova *et al.*, 2021). These differences may stem from more pronounced seasonal abiotic variations and distinct trophic conditions in the northwestern Black Sea.

Elevated TLs during colder seasons may be driven by food availability (diatoms, dinoflagellates), as indicated by the predominance of palmitic acid (16:0), eicosapentaenoic acid (20:5n-3, EPA), and docosahexaenoic acid (22:6n-3, DHA) in the lipid profile (Table 1)—established biomarkers for these algal groups (Zhukova, 2019). Similar FA assimilation patterns occur in mussels during upwelling (Irisarri *et al.*, 2014). These biomarker FAs constituted 27.39% of TLs. The FA analysis period coincided with elevated levels of structural lipids (PLs and sterols). stearic acid (18:0; 7.9% of total FA pool) and arachidonic acid (20:4ω-6; 3.3%) were particularly significant for membrane formation. FA profiling identified multiple sources:
Zooplankton: 20:1ω-9, 20:4ω-6, 20:5ω-3
Bacteria/detritus: 15:0, 17:0, 18:1ω-9(t)
Endogenous biosynthesis: 16:0, 18:0, 16:1ω-5, 20:1ω-9 (Zhukova, 2019).

High SFA content (especially 16:0 and 18:0) may reflect accumulation for conversion into 20:1ω-9, 18:2ω-6, prostaglandin precursor 20:4ω-6, and 22:6ω-3 (Brett *et al.*, 1997). Key PUFAs—EPA and DHA—indicate specific adaptive mechanisms maintaining

membrane functionality under temperature and salinity shifts (Copeman & Parrish, 2004; Zhukova, 2019). Notably, 22:6ω-3 may originate from dietary sources or endogenous synthesis from 20:5ω-3 (1.9% of FA pool) (Pollero *et al*., 1979). The presence of 22:4ω-6,9,12,18 (2.4% of FA pool), classified as an NMI FA (non-methylene-interrupted fatty acid), demonstrates enhanced oxidative stress resistance due to isolated double bonds (Fokina *et al*., 2018), indicating effective protective mechanisms against environmental challenges (Fokina *et al*., 2018; Zakhartsev *et al*., 1998). Methylene-interrupted fatty acids (MI-FAs) derived from mollusks hold significant potential for applications in the food and pharmaceutical industries due to their unique structure and bioactivity. In the food industry, they can be used: in developing functional foods enriched with PUFAs (omega-3: EPA, DHA) and other rare MI-FAs, such as yogurts, bread, and sports nutrition products; as an alternative to fish oil, thus reducing dependence on traditional fisheries; for lipid stabilization in food products, as some MI-FAs possess antioxidant properties that can extend shelf life; in formulating dietary foods that support cardiovascular and cognitive health, leveraging their low saturated fat content and high levels of DHA. In the pharmaceutical industry, they can be utilized: as anti-inflammatory and cardioprotective agents in combating chronic inflammation, since MI-FAs can modulate cyclooxygenase (COX) and lipoxygenase (LOX) activity, reducing the production of pro-inflammatory eicosanoids, and mitigate atherosclerosis risks by regulating lipid profiles; to shield against neurodegenerative diseases through influences on synaptic plasticity and exert antidepressant effects by modulating serotonergic and dopaminergic systems; to suppress certain pathogenic bacteria, with specific MI-FAs exhibiting activity against *Helicobacter pylori* and *Staphylococcus aureus*; to induce apoptosis in cancer cells (e.g., in leukemia and breast cancer); in developing dietary supplements (DSs) with enhanced bioavailability and creating novel lipid-based nanocarriers for targeted drug delivery. Thus, these mollusk-derived methylene-interrupted fatty acids possess multifunctional potential, ranging from the creation of enriched foods to the development of novel anti-inflammatory, neuroprotective, and anti-tumor drugs. Their application can drive advancements in these industrial sectors and personalized medicine.

22-Dehydrocholesterol in sterol composition may reflect phytoplankton-related dietary specificity. Brassicasterol—a product of sterol metabolism in animals and microorganisms (Costa, 2025)—may also enter this hydrobiont through diet (Leblond, 2023).

MUFA/SFA and PUFA/SFA ratios were 0.41±0.04 and 0.25±0.02, respectively. The ω-3/ω-6 ratio (0.63) in *C. gallina* exceeds the health-beneficial threshold (>0.25; Raes *et al*., 2004) and is substantially higher than in Western diets (Simopoulos, 2003), highlighting its nutritional value.

## CONCLUSIONS

In the sublittoral zone, the striped venus clam *Chamelea gallina*—subjected to elevated anthropogenic pressure—exhibited year-round dominance of structural lipids (PLs and sterols) over storage lipids (TAGs). Significant peaks in TL dynamics occurred during late winter and early spring. The fatty acid profile comprised 23 distinct compounds: 13 SFAs, 5 MUFAs (including one NMI FA), and 4 PUFAs. The sterol profile included three compounds, with cholesterol predominating (21.14±1.06%).

Thus, *C. gallina* holds significant potential as a source of specific lipids (unique NMI FAs, cholesterol) and due to its favorable ω-3/ω-6 ratio. Primary applications include nutraceuticals (production of dietary supplements), pharmaceuticals (cholesterol utilization and NMI FA extraction), and specialized PUFA-enriched foods (using raw materials harvested during optimal seasons). Realizing this potential requires ensuring the environmental safety of raw materials (considering anthropogenic pressure), developing efficient processing technologies, and validating biological activity of target components in clinical studies.

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# ZNAČILNOSTI KOPIČENJA LIPIDOV V NAVADNI VENERICI (*CHAMELEA GALLINA*) V OBREŽNEM PASU KRIMSKE OBALE (ČRNO MORJE)

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*Sezonske študije lipidov pri školjkah so ključne za oceno presnovnih lipidnih profilov in telesnega stanja. Cilj te študije je bil raziskati sezonske vzorce skupnega kopičenja lipidov, identificirati razrede lipidov in določiti sestavo maščobnih kislin navadne venerice (*Chamelea gallina*) iz obrežnega pasu vzdolž krimske obale Črnega morja. Najvišje ravni skupnih lipidov (TL), vključno s triacilgliceroli (zaloge lipidov), so bile opažene v zimsko-pomladnem obdobju, v katerem je sestava maščobnih kislin (FA) obsegala 23 vrst. Sestava maščobnih kislin navadne venerice se je razlikovala od sestave populacij v drugih regijah svetovnega oceana. Rezultate je mogoče uporabiti za celovito oceno vplivov okolja na organizme v raziskavah biomonitoringa in za oceno potencialne hranilne vrednosti teh školjk.*

**Ključne besede:** navadna venerica, *Chamelea gallina*, Črno morje, lipidi, maščobne kisline, sezonskost

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