

## Research on the quality of Manchurian Roe from commerce

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**Abstract.** *Oncorhynchus keta* Manchuria red roe are derived from wild salmon and represent a by-product with high nutritional value. These roe contain important amounts of proteins, easily assimilated fats, lecithin, vitamins, and essential minerals beneficial for human health. Regular consumption may help reduce triglyceride levels and could contribute to fighting depression, arthritis, and Alzheimer's disease. The research highlighted the main sensory, physico-chemical, and microbiological characteristics of the three commercial assortments analyzed, showing that the protein content in all samples was lower than the value declared on the labels.

**Introduction.** Fish roe are highly valued products due to their rich content of essential amino acids, vitamins, minerals, and  $\omega$ -3 fatty acids such as EPA and DHA. Their quality and composition are influenced by factors including fish species, habitat, maturity stage, and processing technologies, while egg size also plays an important physiological and commercial role. Because roe are very sensitive to oxidation and microbial spoilage, preservation methods like salting, drying, freezing, smoking, and pasteurisation are applied to improve shelf life and maintain product quality. The present study evaluates the sensory, physicochemical, and microbiological quality of commercial “Manchurian roe” assortments and analyses their compliance with food safety and quality requirements in relation to current consumer expectations.

**Material and method.** The study analysed three commercial assortments of “Manchurian roe” obtained from *Oncorhynchus keta*, coded as P1, P2, and P3, with five samples collected from local markets for each product. Sensory evaluation was performed using a scoring method that assessed appearance, colour, smell, and taste, while physicochemical analyses included the determination of moisture, protein, lipid, ash, salt content, pH, and acidity through standard laboratory methods such as Kjeldahl, Soxhlet, Mohr titration, and pH measurement. Microbiological investigations focused on detecting pathogenic bacteria, specifically *Salmonella* infection-related *Salmonella* spp. and *Listeria* infection-related *Listeria monocytogenes*, using selective culture media and biochemical identification according to European regulations. Statistical processing of the results was carried out using the SPSS program by calculating the mean, standard deviation, and coefficient of variation.

**Results and discussions.** The physicochemical analysis showed that the pH values of the three roe assortments were within the limits reported in the literature, contributing to product preservation and inhibition of microbial growth. Titratable acidity values suggested the possible use of organic acids with preservative roles, although no preservatives were declared on the product labels, indicating potential misleading labeling practices. Moisture, protein, lipid, ash, and salt contents varied among the assortments, with several values differing from those reported in previous studies and from the nutritional information declared on the labels, especially regarding protein and sodium chloride levels. Although the reduced salt content may appear beneficial from a nutritional perspective, it may negatively affect preservation efficiency and shelf life. Microbiological analyses confirmed that all samples were safe for consumption, as neither *Salmonella* infection-related *Salmonella* spp. nor *Listeria* infection-related *Listeria monocytogenes* were detected.

Table 2. Results of physic-chemical analysis

Specification	P1		P2		P3		Literature data
	Results	Label	Results	Label	Results	Label	
pH	5.5±0.06	-	6±0.06	-	5.73±0.03	-	5.2-6.7
Total acidity	3.57±0.09	-	3.35±0.2	-	3.34±0.02	-	-
Water g/100 g	59.01±0.04	-	57.16±0.27	-	56.66±0.13	-	45.1-57.6
Dry matter g/100 g	41.00±0.04	-	42.84±0.27	-	43.34±0.13	-	-
Proteins g/100 g	21.53±0.09	31	27.26±0.42	31.15	25.27±0.12	31.3	26.8-35
Fats g/100 g	16.4±0.10	11	12.27±0.14	11.77	15.01±0.01	15.19	12-20
Ash g/100 g	3.07±0.01	-	3.31±0.01	-	3.06±0.01	-	1.5-7.1
Salt g/100 g	2.08±0.06	4	2.22±0.03	2.23	2±0.02	1.88	7

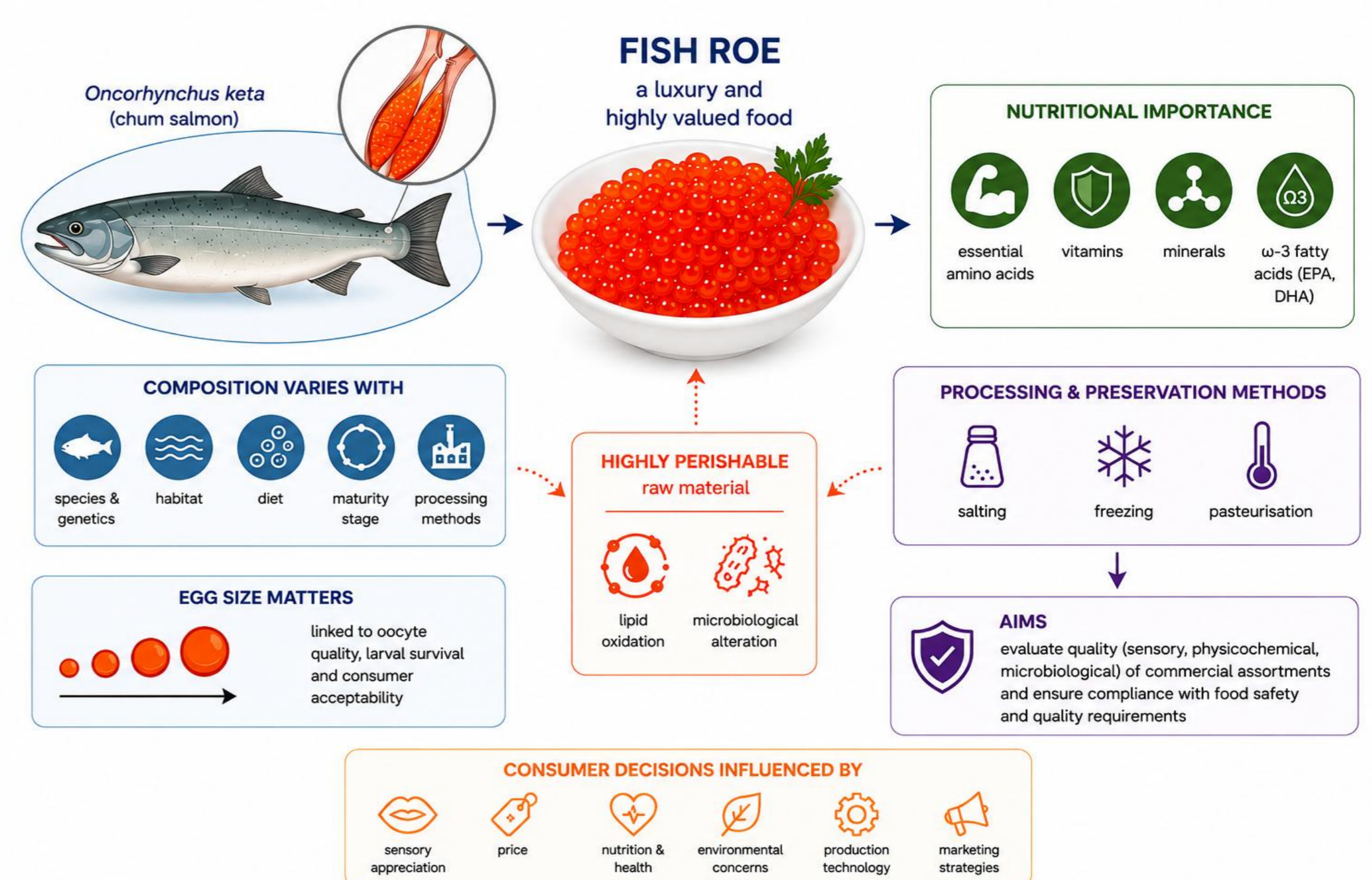


Fig. 1 General overview of the quality and characteristics of Manchurian roe (AI-generated image)

**Results and discussions.** After the sensory analysis, panellists were asked to describe the aroma (smell and taste) profile in specific terms such as fishy, bitter, rancid, etc. Digestion of proteins results in several nitrogen containing products of decomposition e.g. trimethylamine causing the “fishy” odour. Additionally, the amount and composition of fatty acids and or enzymatic-oxidative decay causes unpleasant “odours”. A “fishy” odour and taste indicates starting deterioration of the caviar. A bitter taste, however, develops from strong salting. “Rancid” odour and taste was found for 26 % (n = 4) of samples, which is caused by oxidative deterioration of fatty acids (Table 1).

Table 1. Sensorial features

Attribute	Smell (n)	Taste (n)
<b>Without deviations</b>	8	6
<b>Fishy</b>	6	3
<b>Bitter</b>	-	9
<b>Rancid</b>	4	3
<b>Sour</b>	-	3
<b>Moldy</b>	-	2
<b>Fishy and bitter</b>	-	5
<b>Fishy and rancid</b>	3	3
<b>Fishy and sour</b>	1	1
<b>Fishy, bitter and rancid</b>	-	1

**Conclusions.** *Oncorhynchus keta* “Manchurian roe” showed good nutritional and sensory quality, all analysed assortments being classified in the “good” quality category. Sample P1 obtained the highest consumer appreciation for colour, texture, aroma, and overall acceptability, while P2 recorded the lowest score, although still within acceptable limits. Physicochemical analyses revealed differences between the assortments, especially regarding moisture, dry matter, protein, and salt content. Lipid values were comparable with those reported in the literature, but protein and salt contents differed from the information declared on product labels, suggesting the need for more accurate labeling. The pH values remained within acceptable limits, while low acidity values suggested the possible use of undeclared organic acids during processing. Microbiological analyses confirmed that all samples were safe for consumption, as neither *Salmonella* infection-related *Salmonella* spp. nor *Listeria* infection-related *Listeria monocytogenes* were detected. Overall, the study highlights the good quality of the analysed products, but also the importance of improving labeling accuracy and product traceability.