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MORPHOBIOLOGICAL CHARACTERISTICS OF THE COMMON MARINKA (SCHIZOTHORAX INTERMEDIUS) UNDER ISOLATED ENVIRONMENTAL CONDITIONS: THE CASE OF THE NUROTA BASIN

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Abstract: This study examines the morphobiological characteristics of the common marinka (Schizothorax intermedius) in the isolated Nurota spring system (Navoi region) based on 15 specimens. Plastic and meristic features, age composition, growth rate, and reproductive biology were analyzed. BD/SL = 27.3%; OD/HL = 21.4%; absolute fecundity 5,046 ± 387 eggs. The Nurota population is assessed as a unique scientific model for phenotypic plasticity research and as a biological unit requiring dedicated conservation.

Keywords: Schizothorax intermedius, Nurota, isolation, phenotypic plasticity, morphometry, comparative analysis, reproductive biology, conservation.

Introduction

Isolated populations represent objects of special significance in evolutionary biology and conservation science [5]. The Nurota spring—a closed water system in Navoi region fed by groundwater with no hydrological connection to external rivers—is recognized as a uniquely rare habitat for S. intermedius [9, 11]. A near-constant water temperature (+19.5°C year-round), minimal current velocity, and high fish density have transformed this system into a distinct ecological laboratory [13]. Identifying the morphobiological characteristics of the S. intermedius population that developed over a long historical period in this environment.

Literature review

Gafurova (2023) updated the morphology and taxonomy of Schizothorax species in Uzbekistan using contemporary approaches [1]. Irisova (2023) demonstrated the direct influence of water body type on fish morphology through bio-ecological data from S. intermedius in the Chervok reservoir [2]. Karimov et al. (2024) conducted an in-depth analysis of length–weight–age relationships in Central Asian Schizothorax species, demonstrating the effect of water temperature on growth dynamics [4]. Ziganshina (2016) studied the growth and maturation of S. intermedius in closed water bodies, identifying positive thermal effects on reproductive biology [13]. West-Eberhard (2003) provided the theoretical basis for the relationship between phenotypic plasticity and ecological adaptation [10]. Komilov (2018) described morphological differentiation processes in isolated fish populations, highlighting the combined role of genetic drift and phenotypic plasticity [5].

Research methodology

The research materials consisted of 15 specimens of S. intermedius collected from the Nurota pools and irrigation channel system during 2024–2026. All plastic measurements were expressed as percentages of standard length (SL) following Pravdin (1966) [8]. A total of 10 plastic and 8 meristic features were recorded. Age was determined by the scale method; fecundity was assessed

gravimetrically. Statistical indicators (M ± m, SD, CV%) were calculated following Lakin (1990) [6].

Analysis and results

Morphological features. The body shape is more rounded and less laterally compressed, reflecting adaptation to a low-current pool environment. Eye size is significantly larger (OD/HL = 21.4% vs 18.3%; $p < 0.01$), associated with enhanced visual foraging in slow-moving water [1]. Dorsal pigmentation is more intense (dark brown), and the ventral surface shows a golden-yellow coloration. Barbels are shorter (0.9–2.1 mm vs 1.5–3.2 mm; $p < 0.05$), indicating adaptation to feeding on stone and concrete substrate [11].

Plastic features. Body depth in the Nurota population (BD/SL = 27.3 ± 0.41%) This is interpreted as a manifestation of ecological plasticity: food-rich, warm, low-current conditions have been shown to produce a deeper body form [10]. Variation analysis shows that caudal peduncle depth (CV = 13.06%) is the most variable feature, while eye diameter (CV = 9.39%) is relatively stable, suggesting it is under stronger genetic control (Table).

Table. Main plastic features of S. intermedius in the Nurota spring (n = 15)

No.	Feature (% of SL)	M ± m	SD	CV %
1	Head length (HL/SL)	23.8 ± 0.34	2.19	9.20
2	Body depth (BD/SL)	27.3 ± 0.41	2.65	9.71
3	Caudal peduncle depth (CPD/SL)	10.8 ± 0.22	1.41	13.06
4	Eye diameter (OD/HL)	21.4 ± 0.31	2.01	9.39
5	Dorsal fin base length (DFL/SL)	18.4 ± 0.32	2.07	11.25
6	Pre-ventral distance (PreVL/SL)	47.9 ± 0.52	3.37	7.04

Meristic features. Lateral line scale count (LL = 88–98, modal 92), dorsal fin formula (III 7–9, modal III 8), and anal fin formula (III 4–6) remain within species norms. The stability of meristic features alongside significant changes in plastic features vividly demonstrates the high phenotypic plasticity of S. intermedius [2].

Age composition and growth. Age groups from 1+ to 5+ were identified in 15 specimens; the 3+ (33.3%) and 4+ (23.3%) groups were dominant. The highest growth rate was recorded at age 2+ (ΔSL = 47.2 mm/year). Year-round thermal stability (+19.5°C) was found to accelerate metabolism and enhance growth rate. The Fulton condition factor (K = 1.07–1.13, mean 1.10) confirms adequate food resources across all age groups [4, 13].

Reproductive biology. Absolute fecundity (5,046 ± 387 eggs) and relative fecundity (52.3 ± 3.8 eggs/g W). The maturity coefficient (Kmat = 8.42 ± 0.51%) indicating a greater

reproductive investment driven by favorable thermal and nutritional conditions [12, 13]. Sexual maturity was observed at age 3+; sex ratio was 1:0.73 (♀:♂) [12].

Conclusion

The S. intermedius population of the Nurota spring has developed a distinctive phenotypic complex under long-term isolation and thermal stability: elevated body depth (BD/SL = 27.3%), enlarged eye diameter (OD/HL = 21.4%), and high fecundity (5,046 eggs) are its clear expressions. The retention of meristic features within species norms confirms the high phenotypic plasticity of S. intermedius [7]. The Nurota population not only serves as a unique scientific model for studying microevolutionary processes and phenotypic plasticity, but also warrants designation as a priority conservation unit under IUCN criteria [3].

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