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QUANTITATIVE SPLANCHNOLOGICAL STUDY OF STERLET (*ACIPENSER RUTHENUS*) REARED IN A RAS

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• Abstract

This study aimed to describe the anatomical and morphological characteristics of the internal organs of 1.5-year-old sterlet specimens reared in intensive indoor systems (RAS), using specific quantitative splanchnological methods. The anatomical examination revealed an abdominal cavity with reduced perivisceral fat and a simple digestive tract composed of a short esophagus, a well-developed stomach, and a middle and posterior intestine. The latter was provided with a spiral septum on the inner surface. At the junction between the stomach and the intestine, pyloric ceca were grouped into a spongy-like structure. The liver displayed a clearly lobed structure, while the heart and spleen, though small, were well individualized. The pancreas, with a diffuse structure, was difficult to delimit macroscopically from a morphometric point of view. The gonads, at an early stage of development, were well individualized and covered by a thin layer of fat. The biometric analysis revealed uniform body development and a good physiological condition, typical of fish reared under controlled environmental parameters, confirming their efficient adaptation to intensive rearing conditions. The results highlight a normal morphological development and good physiological adaptation of *Acipenser ruthenus* to the conditions of recirculating aquaculture systems (RAS), confirming the strong biological, adaptive, and economic potential of this species in intensive aquaculture. Overall, the quantitative splanchnological data obtained in this study contribute to a better understanding of the internal morphology of the sterlet and represent a useful foundation for future research on growth physiology and aquaculture improvement in sturgeon species.

Keywords: anatomy, internal organs, intensive rearing, RAS

• Materials and methods

Biometric measurements and dissection procedures:

Biological material:

5 sterlet, 1 year and 6 months old, reared in a recirculating aquaculture system

Measurements performed:

- ✓ Total length (L), standard length (l), maximum body height (H), body girth (G), and body mass (BM).
- ✓ Procedures for dissection and measurement of internal organs



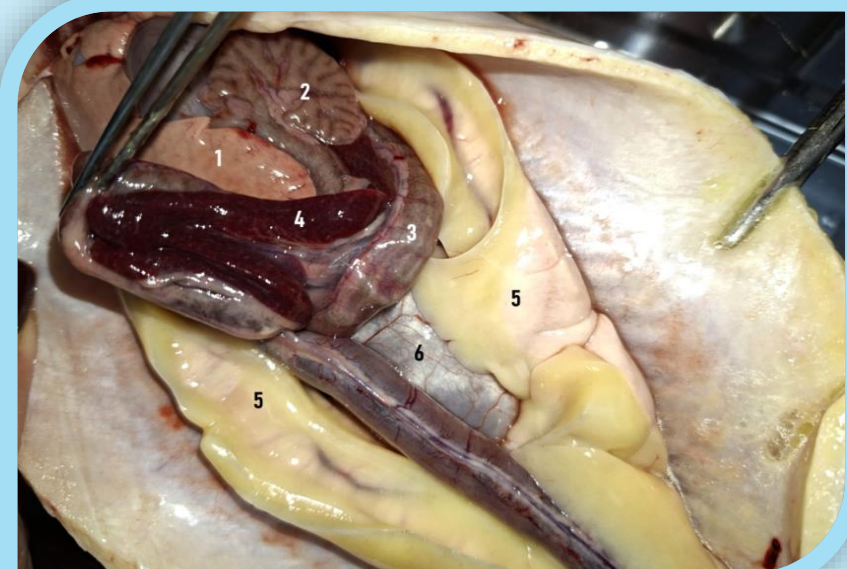
• Results

Biometric data sterlet in the study group (n = 5)

Specification	Total length (cm)	Standard length (l)	Maximum body height (H)	Body girth (G)	Body mass (BM) before evisceration (g)	Body mass (BM) after evisceration (g)
MEAN	59.00	47.26	8.02	19.25	862.60	734.40
SD	0.88	1.11	0.36	0.71	55.76	36.92
SEM	0.39	0.50	0.16	0.32	24.94	16.51
CV	1.49	2.35	4.44	3.71	6.46	5.03
SEM%	0.67	1.05	1.99	1.66	2.89	2.25



1 – pericardial cavity; 2 – right liver lobe; 3 – stomach; 4 – pyloric ceca; 5 – intestine; 6 – gonads; 7 – abdominal wall



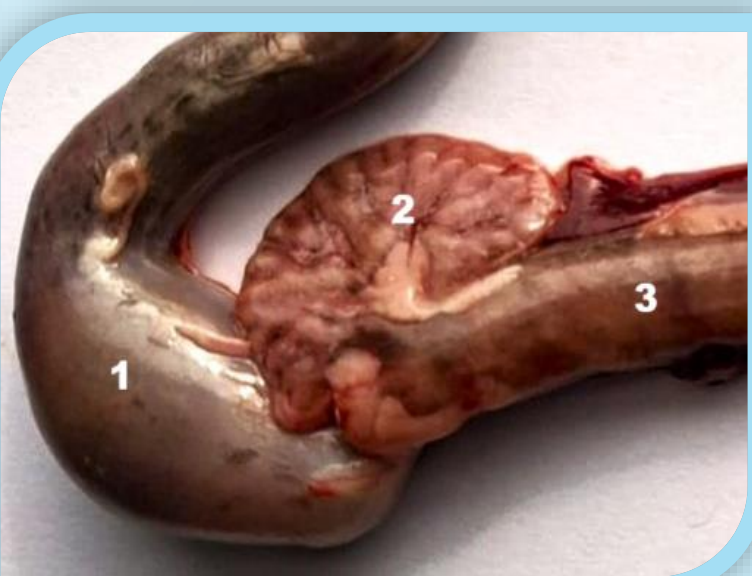
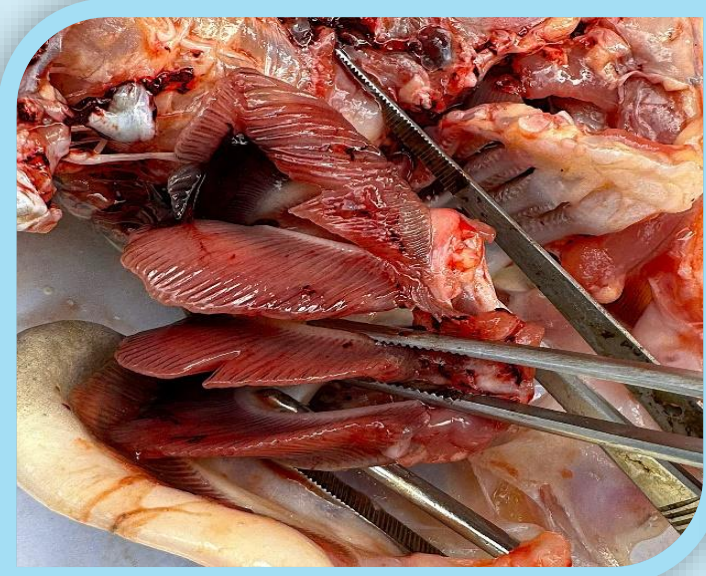
1 – right liver lobe; 2 – pyloric ceca; 3 – intestine; 4 – spleen; 5 – gonads; 6 – swim bladder



1 – right liver lobe; 2 – pyloric ceca; 3 – spleen; 4 – pancreas; 5 – intestine; 6 – left gonad; 7 – adipose tissue

Pharynx

Pyloric ceca in the digestive tract (2)



Data from quantitative splanchnology study of the digestive tract (n = 5)

Specification	Pharynx length (cm)	Esophagus length (cm)	Ø Esophagus (cm)	Stomach length (cm)	Intestine length (cm)	Stomach volume (ml)	Intestine volume (ml)	Stomach weight (g)	Intestine weight including pyloric ceca (g)	Pyloric ceca length (cm)	Pyloric ceca height (cm)	Ø Stomach (cm)	Ø Intestine (cm)
MEAN	2.68	2.84	0.79	13.08	22.94	11.00	17.50	4.20	8.22	2.28	1.66	0.87	0.96
SD	0.18	0.24	0.05	1.92	2.06	1.17	1.58	0.84	1.28	0.68	0.48	0.11	0.15
SEM	0.08	0.11	0.02	0.86	0.92	0.53	0.71	0.37	0.57	0.30	0.21	0.05	0.07
CV	6.69	8.48	6.93	14.67	9.00	10.68	9.04	19.92	15.59	29.65	28.76	12.59	15.80
SEM%	2.99	3.79	3.10	6.56	4.03	4.78	4.04	8.91	6.97	13.26	12.86	5.63	7.06

Gut length in relation to body length

Digestive tract



Data from the quantitative splanchnology study of some organs in the abdominal cavity of sterlet (n = 5)

Specification	Spleen length (cm)	Kidney length (cm)	Gonad weight (g)	Heart length (cm)	Swim bladder length (cm)	Swim bladder weight (g)
MEAN	7.88	18.62	36.00	1.92	8.88	5.60
SD	0.78	0.65	12.63	0.19	0.97	0.89
SEM	0.35	0.29	5.65	0.09	0.43	0.40
CV	9.85	3.47	35.08	10.02	10.90	15.97
SEM%	4.40	1.55	15.69	4.48	4.87	7.14

Liver quantitative splanchnology data (n = 5)

Specification	Left lobe length (cm)	Right lobe length (cm)	Left lobe width (cm)	Right lobe width (cm)	Liver mass (g)
MEAN	7.93	10.23	1.60	2.33	24.00
SD	0.71	0.83	0.08	0.36	2.16
SEM	0.32	0.37	0.04	0.16	0.97
CV	8.97	8.08	5.10	15.46	9.00
SEM%	4.01	3.61	2.28	6.91	4.03



Liver



Spleen



Kidney (1) and swim bladder trace (2)



Gonads



Heart

• Conclusions

The measurements revealed an average total length of 59.0 ± 0.4 cm and a mean body mass of 862.6 ± 24.9 g. The Fulton condition factor ($K = 0.82$) confirmed the overall healthy state of the specimens and their harmonious body growth. The digestive tract showed a mean stomach length of 13.1 ± 0.9 cm, an intestinal length of 22.9 ± 0.9 cm and a liver mass of 24.0 ± 1.0 g, indicating proportional organ development and a good nutritional status.

The results highlight a normal morphological development and good physiological adaptation of *Acipenser ruthenus* to the conditions of recirculating aquaculture systems, confirming the strong biological, adaptive, and economic potential of this species in intensive aquaculture. Overall, the quantitative splanchnological data obtained in this study contribute to a better understanding of the internal morphology of the sterlet and represent a useful foundation for future research on growth physiology and aquaculture improvement in sturgeon species.