RESEARCH REGARDING AGE INFLUENCE ON SLAUGHTERING VALUE AT EUROPEAN CATFISH (*SILURUS GLANIS*)

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Abstract

From economic point of view, a very important role in optimization of production in aquaculture is represented by slaughtering age of the population destined to commercialization. The current paper aims to establish the existent correlation between slaughtering age and participation of cutting regions in composition of total corporal mass for breed Silurus glanis. Experiences were carried out on three batches of European catfish with different ages (2nd summer, 3rd summer and 4th summer), reared in soil basins in extensive system. For feeding, the studied population utilised the natural trophic resources in basins, being composed mainly from fishes which belongs to Cyprinidae family. Environmental growing conditions in rearing system were the ones characteristic for NE area of Romania. Mean weight at slaughtering for first batch (L_1) was 890.06 g, for second batch (L_2) was 1345.89 g, and 2109.83 g for the third batch (L_3). Was studied warm yield in carcass, torso and skinless filet, and also the rate of head, viscera, gills, fins, vertebral column, skin and barbels in composition of total corporal mass. From commercial point of view present interest the muscular tissue which has the highest rate in comparison with other cutting regions, recording values between 41.05 and 50.15%, from total corporal mass. At opposite spleen is situated, these one having the lowest values related to corporal mass, for all three batches.

Key words: slaughtering yield, European catfish, age, corporal mass

INTRODUCTION

Aquaculture is an activity which knows an ascendant development in the last years due to dissemination on a large scale of information regarding valuable nutritive qualities of fish meat is an activity. Even if the demand of fish based products is situated on an ascendant trend, this aspect didn't guarantee the selling of the final product, only by fulfilling of certain criteria. One of these is representing by reared breed.

European catfish (*Silurus glanis*), the main exponent of family *Siluridae* on European continent [14], is a breed which knows a spectacular increase in ten European countries (Austria, Bulgaria, Croatia, Czech Republic, France, Germany, Hungary, Republic of Moldova, Poland and Romania) from 350 tons/year in 1993, to around 1200 de tons/year nowadays [16]. This evolution is justified by three main factors: very tasty meat, appreciated by consumers especially in Eastern Europe and Asia [9], is a useful fish in fisheries exploitations, where being reared in poly-culture with other breeds assure a good state of health to biocenosis from which is a part of it [1], [3], and at last but not least, due to its impressive dimensions which are reached and fight during drill is highly appreciated for sport angling in countries like Spain, The Netherlands, France and Italy [2]. Also the growing rhythm is very good, tegument is without scale, and meat is white, without bones, having lipid content between 4 - 8% [7], [8].

Another important criterion is financial aspect involved in realization of production for this breed. Having in view that European catfish is an ichthyophagous breed, which demands a great financial effort to obtain the desired dimensions for selling this thing is

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The manuscript was received: 18.05.2014
Accepted for publication: 03.06.2014

also reflected in the final cost of the product. Therefore the establishing of optimal slaughtering age is a determinant criterion for economic efficiency, being identified at the same time with the aim of the current paper.

MATERIAL AND METHODS

To achieve the goals of the current study were used 30 individuals of European catfish (*Silurus glanis*), which were gathered from a fishery in Iaşi County. Were made 3 batches of 10 individuals each, being differentiated by age as follows: L_1 fishes of 2nd summer, L_2 correspond to 3rd summer and L_3 batch for individuals of 4th summer. Biologic material was transported in live state at Aquaculture laboratory from UASVM Iaşi where was slaughtered and were effectuated gravimetric measurements to determine warm yield in carcass, torso and filet, and also for establishing of cutting regions in composition of total corporal mass. To realize a qualitative separation, we grouped the anatomical parts which were gravimetric evaluated function of their economical importance.

Carcass is represented by fish body which was eviscerated and after gills were removed. Torso is represented by fish body eviscerated and headed and filet represents the muscular tissue without skin and bones, gathered parallel with vertebral column [12]. Decapitation was realized using a shape cutting around opercles, fact which allow a better capitalization of muscular tissue [11].

Determination of mass of cut regions was realised in maximum one hour from slaughtering. The obtained data were used to calculate warm yield value of slaughtering, for those three methods of technological processing, being expressed as the rate between mass of warm carcass, torso or filet and live mass of fishes.

Were selected these processing methods because are identical with the forms in which European catfish is commercialized.

It was also established gravimetric composition of the studied individuals. This one represents the rate between each corporal component and the total mass of fish [10]. In this way was established the rate of head, fins, gills, vertebral column, skin and barbells face to the total mass of fish, for each age. Fish is considered to be more valuable when its gravimetric composition is in the favour of eatable parts [15].

Last category of gravimetric determinations is regarding the rate of visceral mass, and the rate of the main internal organs face to total corporal mass. Evisceration was realised through a longitudinal incision on ventral median line, which starts from gills till the level of anal orifice. Total visceral mass was weighted and also were weighted the following internal organs: liver, spleen, heart, kidneys and swim bladder.

To establish the rate of cutting regions into composition of total corporal mass, for each studied individual was utilised the following formula:

$$P\ (\%) = \frac{\text{mass of cutting region (g)}}{\text{total live mass (g)}} \text{ x100}$$

Samples were processed using laboratory instruments such as: knives, bistouries, scissors, tweezers, spreaders, gauze and Petri plates. For gravimetric determinations, in all working stages were utilised: a technical balance Shimadzu UX4200H, with a measurement interval of 0.01 g – 4,200 g (production 2005, measurement units: g, kg, ct, lb; precision – 0.01 g, repeatability – 0.01 g, linearity – 0.02 g, auto-calibration function and communication with PC by a serial port RS232) and an analytical balance Denver Instruments Pinnacle 214, with measurement interval between 0.1 mg – 210 g (production 2004, measurement units: g, kg, mg, ct, lb; precision – 0.2 mg, repeatability – 0.1 mg, linearity – 0.2 mg, auto-calibration function and communication with PC by a serial port RS232).

The obtained data for gravimetric determinations were statistically processed for calculus of some statistical estimators, appreciation of variation, of its limits, mean value, differences and their signification.

RESULTS AND DISCUSSIONS

Mean corporal mass at slaughtering recorded for the first batch of European

catfish (L_1), was 890.06 g, at second batch (L_2) was 1345.89 g, and at last batch (L_3) was 2109.83 g (*table 1*). Variation coefficient recorded close values for all three batches, minimum limit being 7.81% for L_2, and maximum was 9.05%, both for L_1 and L_3. These results are specific to low variability, showing the homogeneity of batches [13].

European catfish processed as carcass recorded a slaughter yield of 84.08%, for 2nd summer batch, the one of 3rd summer being higher with 2.82%, the ascendant trend being observed at 4th summer batch which recorded the highest value (90.27%). Those data show the fact that catfish is one of fish breeds which could be well processed under carcass form.

Table 1 Slaughter yield at regions with high economic value calculated for breed *Silurus glanis*

Specification	Silurus glanis Se_{1+} (L_1)		Silurus glanis Se_{2+} (L_2)		Silurus glanis Se_{3+} (L_3)	
	$\bar{X} \pm s_{\bar{X}}$	V%	$\bar{X} \pm s_{\bar{X}}$	V%	$\bar{X} \pm s_{\bar{X}}$	V%
Live mass (g)	890.06±80.51	9.05	1345.89±105.07	7.81	2109.83±190.88	9.05
Carcass mass (g)	748.36±76.36	10.20	1169.57±91.41	7.72	1904.54±169.93	9.12
Yield in carcass (%)	84.08±1.39	1.65	86.90±0.99	1.14	90.27±0.64	0.72
Torso mass (g)	545.25±54.64	9.99	874.29±68.30	7.81	1413.58±128.05	9.06
Yield in torso (%)	61.26±0.72	1.18	64.96±0.93	1.43	67.00±1.06	1.58
Filet mass (g)	365.36±39.02	10.68	647.23±50.49	8.60	1058.07±96.36	9.14
Yield in filet (%)	41.05±1.07	2.60	48.09±1.10	2.29	50.15±1.10	2.19

Processed as torso, biological material recorded the highest values for batch L_1. Due to the fact that torso rate in composition of corporal mass is around 65%, this value show a good availability for being processed in these way.

From economic point of view the valuable form of fresh fish processing is represented by filet. Slaughter yield of European catfish under this form is high, with a value of 41.05% for batch L_1, with 7.04% higher for batch L_2, while batch L_3 recorded an increase of only 2.60%, face to the previous batch. The obtaining of those values is a qualitative indicator for meat production at individuals of European catfish with a mean of corporal mass situated around value of 1500 g.

Table 2 Main indexes of meat production for breed *Silurus glanis*

Specification	U.	Silurus glanis Se_1 (L_1)		Silurus glanis Se_{2+} (L_2)		Silurus glanis Se_{3+} (L_3)	
		$\bar{X} \pm s_{\bar{X}}$	V%	$\bar{X} \pm s_{\bar{X}}$	V%	$\bar{X} \pm s_{\bar{X}}$	V%
Live weight	g	890.06±80.51	9.05	1345.89±105.07	7.81	2109.83±190.88	9.05
Head	g	196.25±15.46	7.92	270.12±20.94	7.79	425.76±37.89	8.98
	%	22.05±0.62	2.82	20.07±0.30	1.50	20.18±0.79	3.90
Fins	g	35.78±2.94	8.31	47.10±3.52	7.45	74.26±6.74	9.16
	%	4.02±0.35	8.69	3.51±0.14	3.98	3.52±0.09	2.59
Gills	g	31.06±4.09	13.42	40.37±2.92	7.20	53.16±4.71	8.94
	%	3.49±0.20	5.58	3.00±0.15	5.05	2.52±0.09	3.64
Vertebral column	g	89.18±7.30	8.35	122.47±9.48	7.81	190.51±17.24	9.08
	%	10.02±0.54	5.37	9.10±0.23	2.52	9.03±0.76	8.46
Skin	g	44.85±4.01	9.02	53.97±3.81	7.06	86.29±7.83	9.27
	%	5.04±0.45	8.92	4.01±0.31	7.74	4.09±0.35	8.45
Barbels	g	0.80±0.07	8.09	0.67±0.05	7.51	1.26±0.14	11.53
	%	0.09±0.01	14.32	0.05±0.01	15.47	0.06±0.01	13.90

In table 2 is presented the rate of some certain cutting portions in composition of total corporal mass. Those components have a lower economical value face to the one analysed in previous table. The main corporal component which has a significant influence on meat production is head, which at studied individuals from *Silurus glanis* breed presented a rate of 22.05% for catfishes of 2nd summer, 20.07% for individuals of 3rd summer respectively 20.18% for individuals of 4th summer. These values are quite high face to other breeds [5].

Function of the influence which each analysed components had on quantitative meat production was obtained the following range: vertebral column > skin > fins > gills > barbels. This classification is valid for all three batches.

Table 3 Rate of visceral mass and internal organs at breed *Silurus glanis*

Specification	U	Silurus glanis Se_{1+} (L_1)		Silurus glanis Se_{2+} (L_2)		Silurus glanis Se_{3+} (L_3)	
		$\bar{X} \pm s_{\bar{X}}$	V%	$\bar{X} \pm s_{\bar{X}}$	V%	$\bar{X} \pm s_{\bar{X}}$	V%
Live weight	g	890.06±80.51	9.05	1345.89±105.07	7.81	2109.83±190.88	9.05
Visceral mass	g	82.24±7.42	9.02	121.26±8.81	7.26	180.81±15.90	8.86
	%	9.24±0.14	1.49	9.01±0.15	1.63	8.57±0.25	3.12
Liver	g	23.14±1.30	5.98	34.72±2.85	8.58	54.85±5.21	9.48
	%	2.60±0.34	13.08	2.58±0.17	6.44	2.60±0.12	4.60
Heart	g	1.06±0.09	8.01	1.07±0.08	7.90	1.68±0.15	9.06
	%	0.12±0.02	17.20	0.08±0.01	8.56	0.08±0.01	9.15
Kidneys	g	8.90±0.74	8.35	11.70±1.09	9.27	21.52±1.83	8.56
	%	1.00±0.02	1.94	0.87±0.04	4.06	1.02±0.06	6.24
Spleen	g	0.71±0.05	7.57	0.53±0.04	7.70	1.05±0.10	9.71
	%	0.08±0.01	5.98	0.04±0.01	15.74	0.05±0.01	14.72
Swim bladder	g	8.01±0.71	8.86	9.55±0.55	5.76	14.76±1.30	8.72
	%	0.90±0.05	5.34	0.71±0.03	4.30	0.70±0.03	3.92

Analysing the data presented in table 3 could be observed that for studied breed visceral mass recorded values close for all three age categories. Comparatively with other breeds commercialized for consumption, visceral mass had a lower rate face to total corporal mass [4], [5] representing 9.24% for batch L_1, 9.01% for batch L_2, and only 8.57% for the third studied batch. The highest value of viscera was obtained for individuals of 2nd summer and the lowest one for individuals of 4th summer, fact which show a regression of visceral mass with aging.

From those five evaluated internal organs, the highest rate belongs to liver, without presenting significant differences for those three age categories. The calculated values for variation coefficient in liver case were lower than 10% in case of individuals of 3rd and 4th summer and higher for individuals of 2nd summer. In a descendant range of rate in composition of organism were placed kidneys with a values between 0.87 and 1.02%, swim bladder with values from 0.70 to 0.90%, while heart had the lowest rate, being between 0.08 and 0.12%. At European catfish the lowest rate in participation on composition of total corporal mass belonged to spleen which recorded a mean value of only 0.04% for individuals of 3rd summer, and at the opposite pole being individuals from 2nd summer (0.08%).

Value of calculated indicators for meat quantitative production for all three experimental batches were in the limits mentioned in literature for *Silurus glanis* breed [4], [5] and [6].

CONCLUSIONS

From the above mentioned data we can conclude that with aging at *Silurus glanis* breed, muscular tissue, the most valuable corporal component from economical point of view, had an ascendant evolution, in detriment of less economical importance elements. This increase is more accentuated in interval 2nd summer – 3rd summer, than in

interval 3rd summer – 4th summer. This is the reason why it is recommended evaluation of production costs related to interval 3rd – 4th summer, in correlation with growing gain.

Per ensemble, the best values for meat production indicators were obtained at European catfish individuals of 4th summer from batch L_3, which show the fact that from quantitative point of view the studied breed is recommended to be capitalized at the age of 4th summer, or at reaching of a corporal mass situated around the value of 2000 g.

The presented data must be interpreted taking in account the rearing system, which have a great influence on corporal development of the studied biological material.

ACKNOWLEDGMENTS

This paper was *published under the frame of* European Social Fund, *Human Resources Development Operational Programme 2007-2013, project no.* POSDRU/159/1.5/S/132765.

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