# COMPARATIVE STUDY OF SOME INDICES AND BODY COEFFICIENTS OF *SILURUS GLANIS* AND *CYPRINUS CARPIO* IN DIFFERENT STAGES OF DEVELOPMENT

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**Abstract**

*The purpose of this paper is a age comparative analysis of indices and body coefficients (profile index, the Kiselev index, sarcous index and Fulton coefficient) for two species of cultured fish (Cyprinus carpio and Silurus glanis). These coefficients may be used to characterize morphologically a stock and also to appreciate the degree of normality or the physiological control of fish, especially for their selection. The highest physiological condition (pathophysiological) was obvious for carp specimens, the highest value recorded was at the age of two. The sarcous index, expressed by the head proportion from the standard body length for all stages of development examined, the lowest recorded was for Silurus glanis individuals, which represents a greater sarcous for them. Comparing the index values and the coefficients body analysis it was noticed that fish have developed smoothly and showed a good maintenance condition.*

**Key words**: index, coefficients, *Silurus glanis*, *Cyprinus carpio*

## INTRODUCTION

Development of modern aquaculture and the increasing consumer demand provoke improvements in the complex breeding technologies of economically valuable fish species [2]. Body indices is the ratio of body size related morphological or physiological, or shows some general characteristics, certain productive skills. These indices helps to verify progress and the choice of material selected as the most interesting specimens, obtaining favorable morphological characters to a line of high efficiency [3].

## MATERIAL AND METHODS

Biometric analysis was performed on 70 individuals of different ages (one, two and three summers) for each species taken in the study derived from Fish Farm Ţigănaşi, Iasi County. For samples seized achieved tangible measures on the main parameters that were used in the calculation of indices and body factors (profile index, Kiselev index, sarcous index and Fulton coefficient). The data obtained were statistically processed by calculating the mean, standard error, standard deviation, coefficient of variation and limits of confidence intervals [4], [1], [5].

## RESULTS AND DISCUSSIONS

For profile index (height), which highlights the body size of fish, the lowest values was recorded in stage three of development both for *Silurus glanis* samples and those of *Cyprinus carpio*.
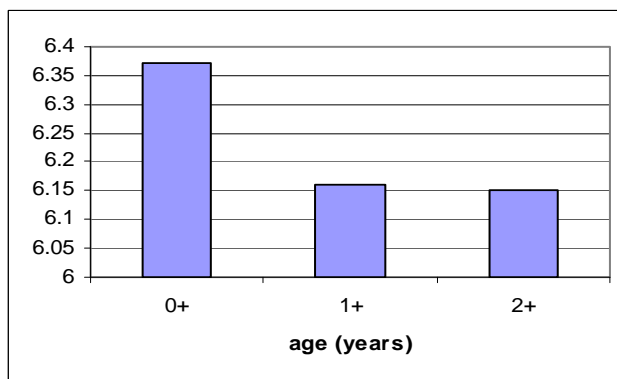


Fig.1. Graphical representation of profile index In *Silurus glanis* of various ages
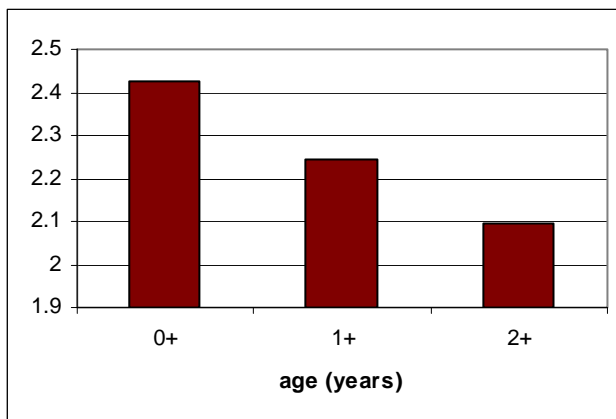
Fig.2. Graphical representation of profile index in *Cyprinus carpio* of various ages

Table 1.

Values of the main statistical indices of profile index in *Cyprinus carpio*
and *Silurus glanis* of varous ages

| Species | *Cyprinus carpio* | | | *Silurus glanis* | | |
|---|---|---|---|---|---|---|
| AGE (YEARS) | | | | | | |
| STATISTICAL INDICES | 0+ | 1+ | 2+ | 0+ | 1+ | 2+ |
| Mean | 2.425 | 2.242 | 2.095 | 6.371 | 6.159 | 6.151 |
| Standard error | 0.018 | 0.025 | 0.007 | 0.116 | 0.029 | 0.030 |
| Median | 2.424 | 2.242 | 2.100 | 6.666 | 6.199 | 6.170 |
| Standard deviation | 0.154 | 0.215 | 0.061 | 0.971 | 0.250 | 0.258 |
| Sample variance | 0.023 | 0.046 | 0.003 | 0.943 | 0.062 | 0.066 |
| Minimum | 2 | 1.452 | 1.773 | 3.909 | 5.467 | 5.467 |
| Maximum | 2.803 | 2.612 | 2.185 | 8.043 | 6.646 | 6.689 |
| Confidence level (95%) | 0.036 | 0.051 | 0.014 | 0.231 | 0.059 | 0.061 |
| Lower limit | 2.388 | 2.191 | 2.080 | 6.139 | 6.099 | 6.090 |
| Upper limit | 2.461 | 2.294 | 2.110 | 6.603 | 6.219 | 6.213 |
| CV% | 6.363 | 9.619 | 2.953 | 15.246 | 4.067 | 4.204 |
| m% | 0.760 | 1.149 | 0.353 | 5.818 | 0.486 | 0.502 |

CV% = mean variation coefficient, m% = mean precision coefficient

The data presented in table 1 it is noted that during the three developmental stages analyzed, the carp minimum profile index is 1.452 at the age of two, and the maximum value is 2.803 in the first summer. At wels catfish the minimum and maximum were found at age one summer (3.909, respectively 8.043).

The lowest coefficient of variation of the average profile index in carp was recorded at the age of three summers, and to wels catfish in the second developmental stage.

At *Silurus glanis* Kiselev index (quality) determined in first growth summer the lowest values of the relationship between standard length and body girth. Carp individuals observed an increase of Kiselev index values in second growth summer (1.209) against first summer (1.101) and third summer (1.043).
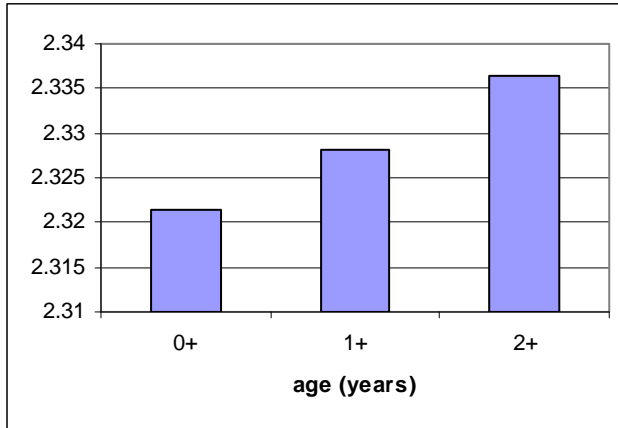
Fig.3. Graphical representation of Kiselev index in *Silurus glanis* of various ages
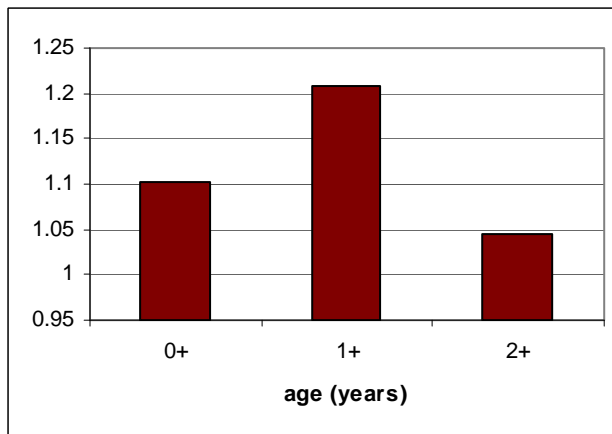
Fig. 4. Graphical representation of Kiselev index in *Cyprinus carpio* of various ages

Table 2.

Values of the main statistical indices of Kiselev index in *Cyprinus carpio*
and  *Silurus glanis* of various ages

| Species | *Cyprinus carpio* | | | *Silurus glanis* | | |
|---|---|---|---|---|---|---|
| AGE (YEARS) | | | | | | |
| STATISTICAL INDICES | 0+ | 1+ | 2+ | 0+ | 1+ | 2+ |
| Mean | 1.101 | 1.209 | 1.043 | 2.321 | 2.328 | 2.336 |
| Standard error | 0.006 | 0.009 | 0.003 | 0.024 | 0.012 | 0.013 |
| Median | 1.098 | 1.214 | 1.043 | 2.338 | 2.333 | 2.333 |
| Standard deviation | 0.051 | 0.081 | 0.029 | 0.208 | 0.104 | 0.113 |
| Sample variance | 0.002 | 0.006 | 0.0008 | 0.043 | 0.010 | 0.012 |
| Minimum | 0.992 | 0.758 | 0.933 | 1.694 | 2.038 | 2.035 |
| Maximum | 1.213 | 1.324 | 1.128 | 3 | 2.531 | 2.721 |
| Confidence level (95%) | 0.012 | 0.0193 | 0.007 | 0.049 | 0.024 | 0.027 |
| Lower limit | 1.089 | 1.189 | 1.036 | 2.271 | 2.303 | 2.309 |
| Upper limit | 1.113 | 1.228 | 1.050 | 2.371 | 2.353 | 2.363 |
| CV% | 4.629 | 6.722 | 2.824 | 10.462 | 4.500 | 4.852 |
| m% | 0.553 | 0.803 | 0.337 | 1.250 | 0.537 | 0.579 |

CV% = mean variation coefficient, m% = mean precision coefficient

During the three developmental stages analyzed, the lowest variation coefficient of the mean Kiselev index recorded for specimens of carp three summer old (2.824%) and the second summer old for wels catfish (4.5%).

The best physiological (pathophysilogical) condition or so-called "general condition" of the body was recorded for carp specimens with highest values at the age of two summer (3.416%). For wels catfish individuals the Fulton coefficient average values follows a decreasing curve (fig. 5), with a maximum at one summer old specimens (0.873) and a minimum at age three summer (0.237).



Fig.5. Graphical representation of Fulton coefficient in *Silurus glanis* of various ages
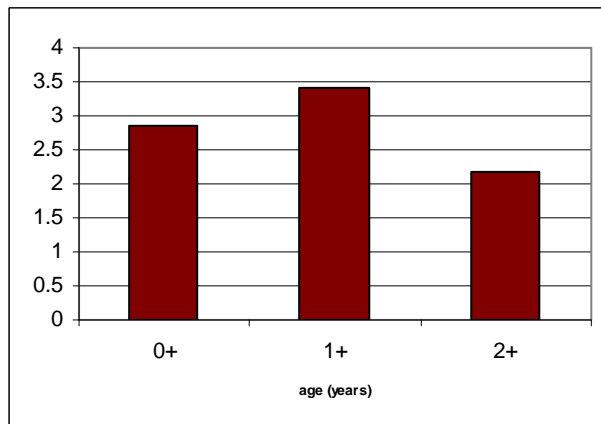


Fig.6. Graphical representation of Fulton coefficient In *Cyprinus carpio* of various ages

Table 3. Values of the main statistical indices of Fulton coefficient in *Cyprinus carpio*
and *Silurus glanis* of various ages

| Species | *Cyprinus carpio* | | | *Silurus glanis* | | |
|---|---|---|---|---|---|---|
| | AGE (YEARS) | | | | | |
| STATISTICAL INDICES | **0+** | **1+** | **2+** | **0+** | **1+** | **2+** |
| Mean | 2.865 | 3.416 | 2.170 | 0.873 | 0.691 | 0.237 |
| Standard error | 0.072 | 0.180 | 0.014 | 0.023 | 0.009 | 0.004 |
| Median | 2.807 | 3.156 | 2.161 | 0.842 | 0.686 | 0.231 |
| Standard deviation | 0.607 | 1.510 | 0.121 | 0.197 | 0.081 | 0.035 |
| Sample variance | 0.368 | 2.281 | 0.014 | 0.038 | 0.006 | 0.001 |
| Minimum | 1.508 | 1.985 | 1.883 | 0.480 | 0.538 | 0.169 |
| Maximum | 5.136 | 14.839 | 2.473 | 1.604 | 0.881 | 0.315 |
| Confidence level (95%) | 0.144 | 0.360 | 0.029 | 0.047 | 0.019 | 0.008 |
| Lower limit | 2.720 | 3.055 | 2.141 | 0.826 | 0.672 | 0.228 |
| Upper limit | 3.010 | 3.776 | 2.199 | 0.920 | 0.711 | 0.245 |
| CV% | 21.191 | 44.220 | 5.609 | 22.583 | 11.824 | 14.800 |
| m% | 2.532 | 5.285 | 0.670 | 1.182 | 1.413 | 1.768 |

CV% = mean variation coefficient, m% = mean precision coefficient

As we observed in figures 7 and 8, the sarcous index expressed by the proportion of head in standard length of the body for all stages of development analyzed, the lowest values recorded in both studied species in the three growth summer which means a greater sarcous them at this stage of development.
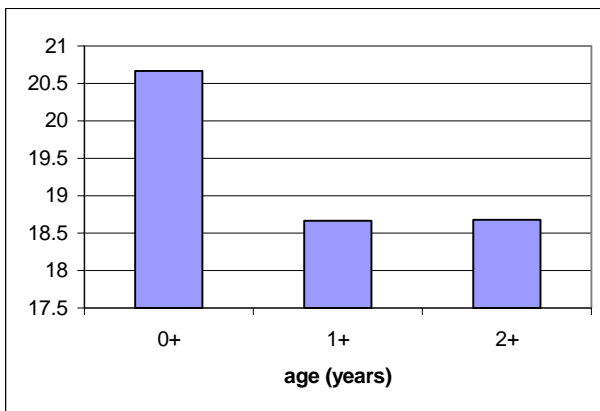


Fig.7. Graphical representation of sarcous index in *Silurus glanis* of various ages
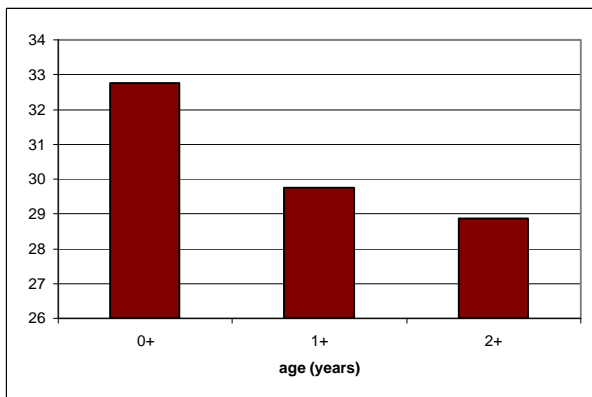


Fig.8. Graphical representation of Kiselev index in *Cyprinus carpio* of various ages

Table 4. Values of the main statistical indices of sarcous index (head percent) in *Cyprinus carpio* and *Silurus glanis* of various ages

| Species | *Cyprinus carpio* | | | *Silurus glanis* | | |
|---|---|---|---|---|---|---|
| AGE (YEARS) | | | | | | |
| STATISTICAL INDICES | 0+ | 1+ | 2+ | 0+ | 1+ | 2+ |
| Mean | 32.755 | 29.751 | 28.874 | 20.669 | 18.666 | 18.677 |
| Standard error | 0.279 | 0.362 | 0.106 | 0.271 | 0.101 | 0.099 |
| Median | 32.608 | 29.577 | 28.801 | 20.354 | 18.476 | 18.543 |
| Standard deviation | 2.337 | 3.033 | 0.891 | 2.271 | 0.847 | 0.829 |
| Sample variance | 5.465 | 9.203 | 0.794 | 5.157 | 0.717 | 0.688 |
| Minimum | 28.260 | 25.311 | 27.073 | 15.942 | 16.629 | 16.870 |
| Maximum | 41.007 | 52.173 | 30.617 | 27.317 | 20.659 | 20.659 |
| Confidence level (95%) | 0.557 | 0.723 | 0.212 | 0.541 | 0.201 | 0.197 |
| Lower limit | 32.198 | 29.028 | 28.661 | 20.127 | 18.464 | 18.479 |
| Upper limit | 33.313 | 30.475 | 28.874 | 21.211 | 18.868 | 18.875 |
| CV% | 7.137 | 10.196 | 3.087 | 10.987 | 4.538 | 4.443 |
| m% | 0.853 | 1.218 | 0.369 | 1.313 | 0.542 | 0.531 |

CV% = mean variation coefficient, m% = mean precision coefficient

During the three stages of development the average percentage share of the head follows a slightly downward curve in both species, the maximum value is recorded in juvenile fish (32.75% in carp, respectively 20.66% at wels catfish), and the minimum at age three summer (28.87% and 18.67%). Also the population of carp and from the wels catfish, in the second stage of development is observed very small differences between the values average of sarcous index.

## CONCLUSIONS

- with a probability of 95% for individuals of both species taken in the study limits the confidence intervals of body indices and coefficients are extremely limited review for all developmental stages of what signifies a uniformity both carp populations and those of wels catfish in all stages of development studied;

- comparing the values of standard error and coefficient of variation reveals that both samples of *Silurus glanis* and those of *Cyprinus carpio* had a harmonious and good maintenance condition.

## REFERENCES

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