ACTA ICHTHYOLOGICA ET PISCATORIA
Vol. XXVI, Fasc. 2 Szczecin 1996

Stanisław *KRZYKAWSKI*, Katarzyna *BANIK*, Artur *ANTOSZEK*

Fish systematics

BIOMETRIC CHARACTERS OF THE BLUE BREAM *ABRAMIS BALLERUS* (L.) (CYPRINIDAE) FROM LAKE DĄBIE

CECHY BIOMETRYCZNE ROZPIÓRA *ABRAMIS BALLERUS* (L.) (CYPRINIDAE) Z JEZIORA DĄBIE

Department of Fish Systematics, Agricultural University of Szczecin, Poland

The paper presents results of study on 24 metric characters and 19 meristic ones, performed on 50 specimens of the blue bream collected in Lake Dąbie. With the aid of Cochran and Cox test the results obtained were compared with the data concerning the population from the river Dnepr.

INTRODUCTION

Range of the blue bream distribution includes areas stretching from the river Rhine (in the west) to the Volga and Ural Mountains (in the east) and from southern Scandinavia to the Danube. The blue bream inhabits lower parts of bigger rivers and some of European lakes.

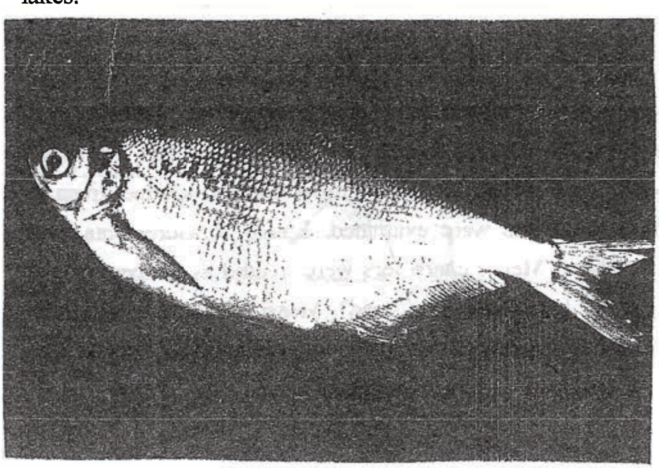

Fig. 1. Blue bream *Abramis ballerus* (L.)

In the waters of our country the blue bream occurs rather rarely (Fig. 1). Most abundantly it is distributed in the Szczecin Lagoon, Lake Dąbie and in the lower part of the river Odra (Kompowski 1971a). According to Kompowski (1991) the mean annual catches of

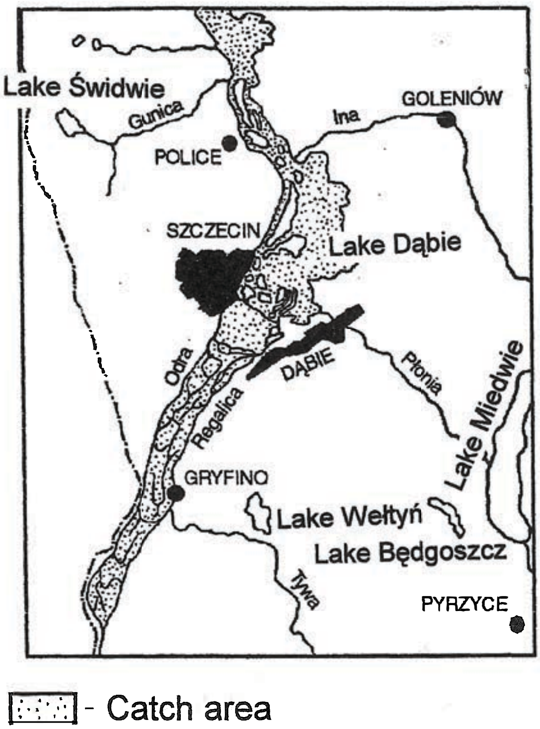

Fig. 2. Catch area of blue bream *Abramis ballerus* (L.) in the vicinity of the city of Szczecin (from Krzykawski and Szypuła 1993)

the fish discussed within 1966–1988 in the estuary of the Odra amounted to 59 ton, what constituted to 2.2% of total catches in this region.

Due to the limited distribution in Poland, the biology of this species is poorly known. The studies hitherto conducted were dealing predominately with its feeding (Kompowski 1971b), growth (Kompowski 1991), reproduction (Karabanowicz and Kompowski 1994), and localities of catches in the region of Szczecin (Krzykawski and Szypuła 1993), which are presented in Fig. 2.

However, no detailed morphometric study on this species has been performed so far, only selected characters were discussed in the available papers.

MATERIALS AND METHODS

The material to the present study was collected on 9 December 1992 in Lake Dąbie.

A total of 50 blue bream was investigated, including 40 females and 10 males. On each individual 24 metric characters (according to the measurement scheme given by Brylińska (1986) and 19 meristic characters were examined. Linear measurements were made to the nearest 0.1 cm with calliper. Metric characters were treated as per cent indices (i.e. in relation to the body length and lateral length of head). Measurement scheme is presented in Fig. 3, while symbols of characters examined are demonstrated in Tab. 1. This table contains also 19 meristic characters along with their symbols used.

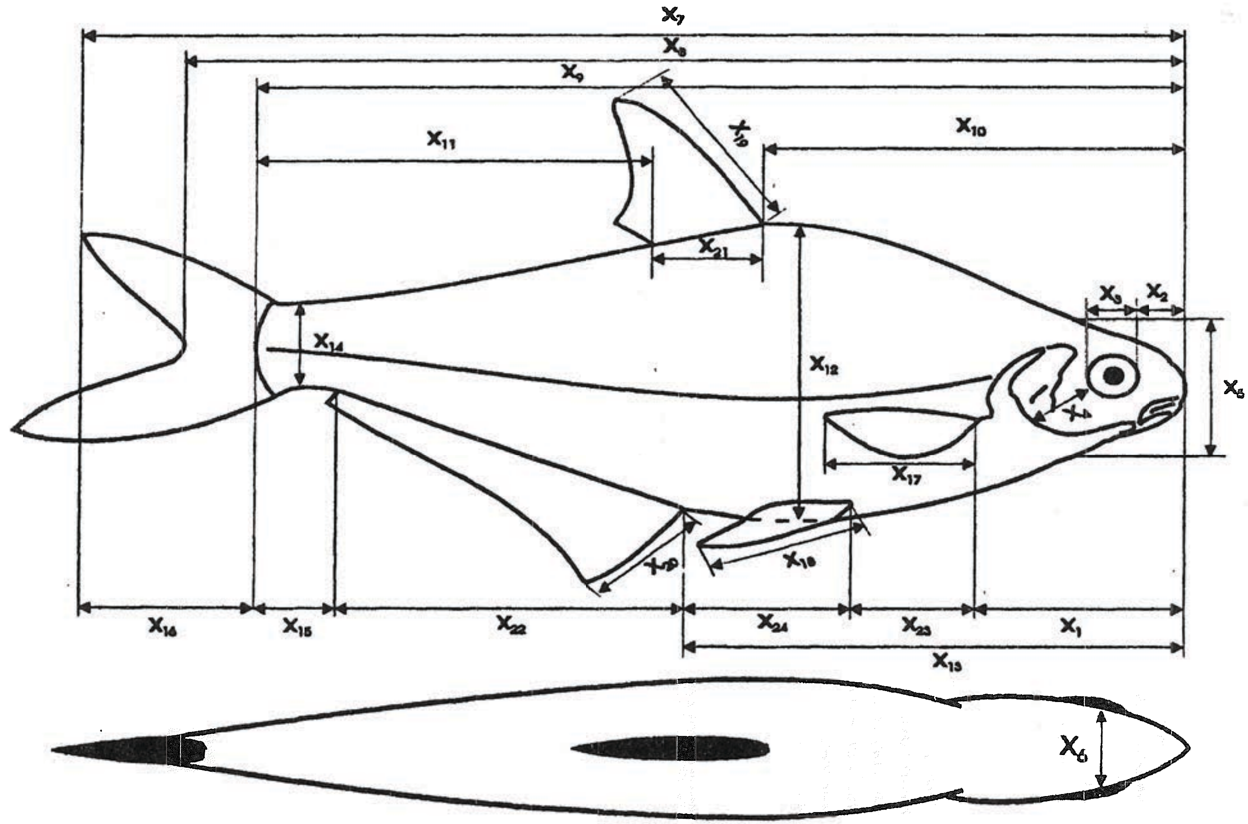

Fig. 3. Measurement design of metric characters

Table 1

Symbols used for metric and meristic characters studied

Symbol of character	Latin name	Symbol of character	Latin name
x_1	*longitudo capitis lateralis*	x_{23}	*distantia P–V*
x_2	*spatium praeorbitale*	x_{24}	*distantia V–A*
x_3	*diameter oculi*	D_t	*numerus radiorum pinnae dorsalis*
x_4	*spatium postorbitale*	D_m	*numerus radiorum pinnae dorsalis*
x_5	*altitudo capitis*	A_t	*numerus radiorum pinnae analis*
x_6	*latitudo capitis*	A_m	*numerus radiorum pinnae analis*
x_7	*longitudo totalis*	C_{t1}	*numerus radiorum pinnae caudalis*
x_8	*longitudo caudalis*	C_m	*numerus radiorum pinnae caudalis*
x_9	*longitudo corporis*	C_{t2}	*numerus radiorum pinnae caudalis*
x_{10}	*longitudo praedorsale*	P_t	*numerus radiorum pinnae pectoralis*
x_{11}	*longitudo postdorsale*	P_m	*numerus radiorum pinnae pectoralis*
x_{12}	*altitudo corporis maxima*	V_t	*numerus radiorum pinnae ventralis*
x_{13}	*longitudo praeanalis*	V_m	*numerus radiorum pinnae ventralis*
x_{14}	*altitudo corporis minima*	$l.l._s$	*numerus squamarum supra linnae lateralis*
x_{15}	*longitudo penducli caudae*	$l.l._i$	*numerus squamarum infra linnae lateralis*
x_{16}	*longitudo pinnae caudalis C*	l.l.	*numerus squamarum linnae lateralis*
x_{17}	*longitudo pinnae P*	$sp.br._1$	*numerus spinarum ad arcum branchii I*
x_{18}	*longitudo pinnae V*	$sp.br._2$	*numerus spinarum ad arcum branchii II*
x_{19}	*altitudo pinnae D*	r.br.	*numerus radiorum branchialis*
x_{20}	*altitudo pinnae A*	vt.	*numerus vertebrarum*
x_{21}	*longitudo basis pinnae D*	os.ph.	*ossa pharynges inferiora, formula dentium*
x_{22}	*longitudo basis pinnae A*		

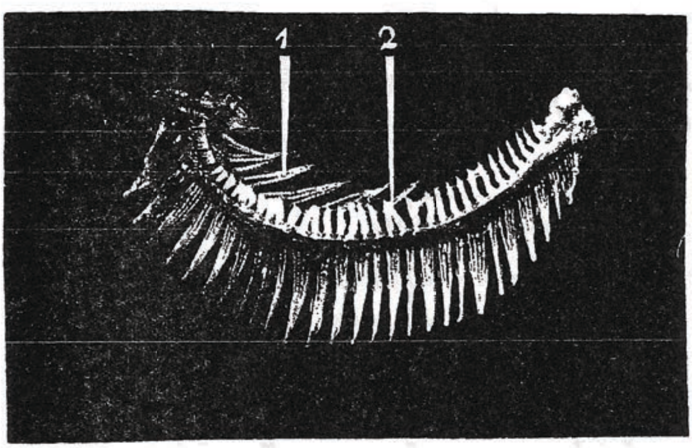

Fig. 4. Gill-arch of blue bream. Gill-rakers arranged in two rows (1 and 2)

Soft and hard fin rays were distinguished in counting, and the vertebrae number count included those of Weberian apparatus. Gill-rakers were counted always on the first gill arch, on the left side of fish head. Gill-rakers in the species studied occurred in two rows (Figs. 4, 5).

Scales were counted above below, and along the lateral line.

Teeth formula of was determined after dissection of the lower pharyngeal arches from left and right side of fish head (Fig. 6). Fig. 7 shows shape of the teeth.

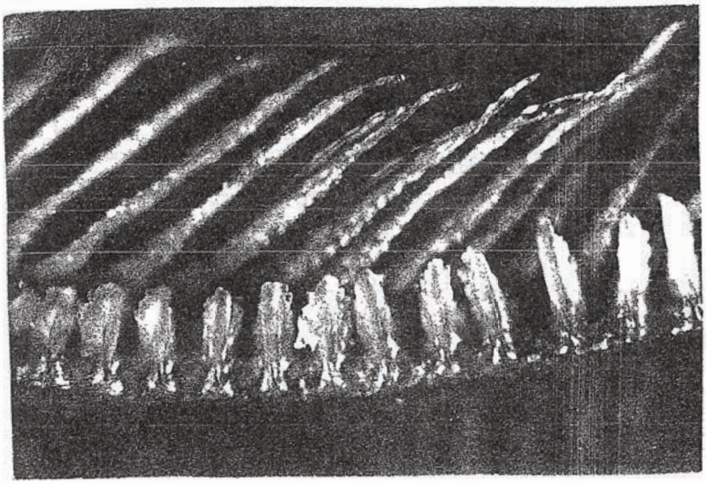

Fig. 5. Different shapes and length of blue bream's gill-rakers

All biometric characters were statistically processed. The following statistical parameters were given: arithmetic mean ($\bar{x}$), standard deviation (S), standard error (m) and coefficient of variation (V). According to Ruszczyc (1981) those characters of V below 10% were considered as low plastic (low variable).

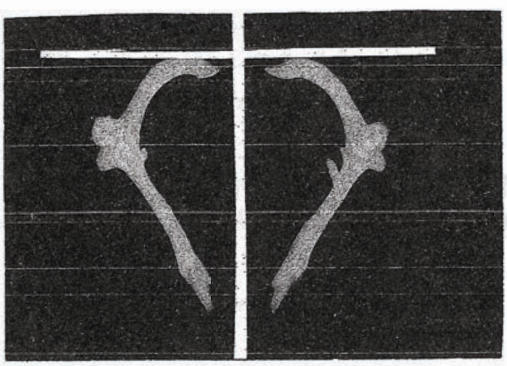

Fig. 6. Lower pharyngeal arches of blue bream

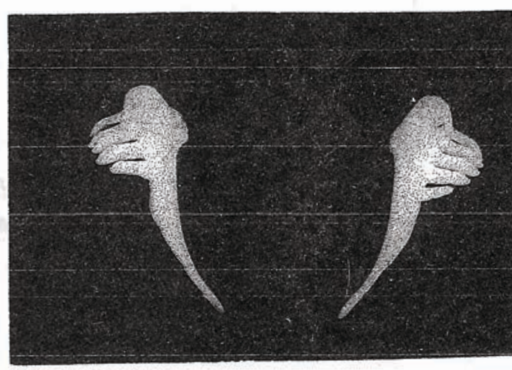

Fig. 7. Shape of pharyngeal teeth of blue bream

In order to compare the results obtained for the studies biometric characters in the fish from Lake Dąbie with the data given in Žukov's (1965) paper concerned the blue bream from the river Dnepr, test C (Cochran, Cox) was used (Oktaba 1974).

RESULTS

Analysis of length distribution

In the sample studied (n = 50) the body length (*longitudo corporis*) of blue bream covered the range from 28.7 cm to 35.2 cm with the mean value of 31.8 cm. Eight 1-cm length classes were established, from 28.1 to 36.0 cm. The results, concerning both sexes, are presented in the graph (Fig. 8).

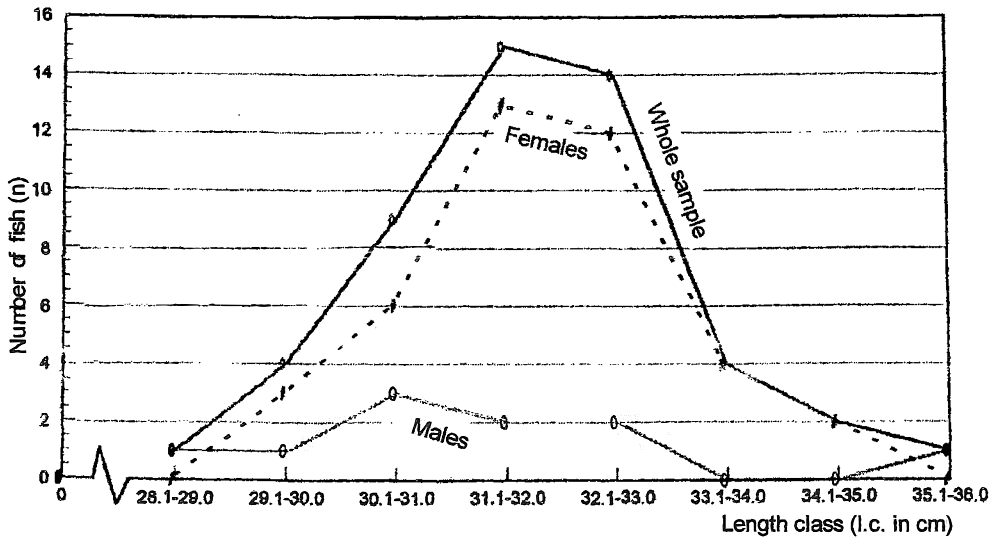

Fig. 8. Length distribution of the sample examined

As can be seen from the diagram the length classes from 31.1 to 33.0 cm were the most abundant. Out of total number as much as 58% of the fish studied were in these two classes. The females were dominant in the classes mentioned. The mean body length of females was 31.9 cm.

Females out numbered the males four times in the sample investigated. The majority of males were in the 30.1–31.0 cm length class. Their mean length (31.3 cm) was lower than that of females.

Owing to the relatively small number of the males in the sample (10 individuals), the analysis of biometric characters was made jointly for both sexes.

Analysis of metric characters

Metric characters of the blue bream as well as their relation to the body length (x_9) and head length (x_1), calculated by means of per-cent indices for whole sample studied, are presented in Tab. 2.

As can be seen from the table the value of coefficient of variation calculated for the per-cent ratios both to the length of the body and head, only in 1 character—namely length of the caudal fin (x_{16}), appeared to be statistically significant (over 10%). This character can be regarded as plastic, i.e. the least useful for taxonomic description of the population of the blue bream from Lake Dąbie.

Meristic characters of the fish investigated are shown in Tab. 3. Coefficient of variation calculated for the characters analysed appeared to be statistically significant (over 10%) for one feature only—the number of hard rays in the upper lobe of the caudal fin (C_{t1}).

Table 2

Metric characters of blue bream from Lake Dąbie in relative values (in % of *longitudo corporis* and % of *longitudo capitis lateralis*)

Symbol of character	Value of character in % *longitudo corporis* (n = 50)				
	Range	$\bar{x}$	*S*	*m*	*V*
x_1	18.2–22.1	19.86	0.73	0.10	3.69
x_2	4.2–5.7	4.89	0.35	0.05	7.07
x_3	4.3–5.6	4.94	0.25	0.03	4.99
x_4	9.4–12.1	10.49	0.53	0.08	5.10
x_5	14.7–21.5	16.40	1.12	0.16	6.85
x_6	9.3–12.4	10.15	0.66	0.09	6.47
x_7	115.5–112.9	120.00	1.68	0.24	1.40
x_8	100.6–110.5	108.84	1.38	0.20	1.27
x_{10}	46.1–53.8	51.51	1.64	0.23	3.19
x_{11}	37.0–43.6	40.66	1.38	0.19	3.39
x_{12}	31.9–37.2	34.68	1.25	0.18	3.61
x_{13}	53.2–60.7	57.22	1.55	0.22	2.71
x_{14}	8.1–10.1	8.77	0.43	0.06	4.85
x_{15}	9.9–13.4	11.65	0.78	0.11	6.66
x_{16}	15.5–25.3	21.40	2.20	0.31	10.29
x_{17}	16.9–21.3	19.29	0.98	0.14	5.09
x_{18}	13.9–21.0	16.00	1.18	0.17	7.39
x_{19}	21.1–25.7	23.16	1.06	0.15	4.58
x_{20}	14.4–18.3	16.18	0.81	0.12	5.03
x_{21}	8.5–12.8	10.47	0.67	0.09	6.42
x_{22}	30.3–37.6	34.39	1.54	0.22	4.49
x_{23}	17.8–22.6	20.81	1.19	0.17	5.74
x_{24}	17.3–21.7	19.68	1.09	0.15	5.37
	Value of character in % *longitudo capitis lateralis* (n = 50)				
x_2	20.9–26.9	24.64	1.33	0.19	5.39
x_3	21.5–29.5	24.89	1.35	0.19	5.43
x_4	47.8–60.0	52.86	2.24	0.32	4.23
x_5	73.8–97.0	82.61	5.09	0.72	6.16
x_6	42.9–58.2	51.15	2.93	0.41	5.73

It seems to be important that on the gill arches of the blue bream two rows of gill rakers (sp. br.$_1$; sp. br.$_2$) were found (Figs. 4, 5) variable in shape and number.

In the sample under study fish had pharyngeal teeth in one row (os. ph.) of the formula 5–5 (35 specimens) or 5–4 (15 specimens). The mean value of the index of arch width for whole material was 46.2%.

DISCUSSION

Tab. 4 compares the range of variation and mean values for some meristic characters of the studied sample from Lake Dąbie in comparison with the data from available literature.

As can be seen from the table, soft rays count in the dorsal fin (D_m) in our own results was constant amounting to 8, while in the other authors' papers the results obtained differed in some extent [except for Aleksandrova (1966) and Titenkov (after Kompowski 1971a)]. Some variation was found by Kompowski (1971a)—range 8–9, while Žukov (1965) and Rolik and Rembiszewski (1987) as wide as 7–9.

Table 3

Meristic characters of blue bream examined

Symbol of character	n	Number of fish with particular value of character. Value of character: 1	2	3	6	7	8	9	10	11	12	13	14	15	16	17	18
D_t	50			50													
D_m	50						50										
A_t	50			50													
A_m	50																
C_{t1}	50					13	14	22	1								
C_m	50														3	47	
C_{t2}	50				49	1											
P_t	50	50															
P_m	50												1	10	20	16	3
V_t	50		50														
V_m	50						50										
l.l.$_s$	50										1	3	14	19	10	3	
l.l.$_i$	49								1	16	29	3					
l.l.	50																
sp.br.$_1$	50																
sp.br.$_2$	50																
r.br.	50			50													
vt.	50																
os.ph.	50																

Symbol of character	31	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
D_t																	
D_m																	
A_t																	
A_m	1	2	2	3	9	15	5	12		1							
C_{t1}																	
C_m																	
C_{t2}																	
P_t																	
P_m																	
V_t																	
V_m																	
l.l.$_s$																	
l.l.$_i$																	
l.l.																	
sp.br.$_1$		1	7	9	6	10	13	2	1	1							
sp.br.$_2$					1		2	1	5	8	8	10	11	1	1	2	
r.br.																	
vt.										1			1	11	17	15	5
os.ph.																	

Symbol of character	65	67	68	69	70	71	72	73	74	Range	$\bar{x}$	S	m	V
D_t										III	3.00	0.00	0.00	0.00
D_m										8	8.00	0.00	0.00	0.00
A_t										III	3.00	0.00	0.00	0.00
A_m										31–41	36.96	1.86	0.26	5.03
C_{t1}										VII–X	8.22	0.85	0.12	10.30
C_m										16–17	16.94	0.24	0.03	1.29
C_{t2}										VI–VII	6.02	0.14	0.02	2.30
P_t										I	1.00	0.00	0.00	0.00
P_m										14–18	16.20	0.89	0.13	5.47
V_t										II	2.00	0.00	0.00	0.00
V_m										8	8.00	0.00	0.00	0.00
l.l.$_s$										12–17	14.86	1.05	0.15	7.05
l.l.$_i$										10–13	11.69	0.61	0.09	5.19
l.l.	1	5	6	5	12	12	3	3	3	65–74	70.07	1.97	0.28	2.81
sp.br.$_1$										33–41	36.50	1.77	0.25	4.77
sp.br.$_2$										36–47	42.28	2.12	0.30	5.02
r.br.										3	3.00	0.00	0.00	0.00
vt.										41–48	46.14	1.20	0.17	2.61
os.ph.										5–5, 5–4	—	—	—	—

Mean value of soft rays count in anal fin (A_m) in the present study was slightly lower when compared with the data from literature. In Aleksandrova (1966) mean value was as much as 40.0. The present study yielded 31 rays as the minimum number, while Rolik and Rembiszewski (1987) recorded 34 and Kompowski (1971a) and Žukov (1965)—35.

The range of soft rays in pectoral fin (P_m) differs feebly, too. The blue bream in our own investigation had from 14 to 18 rays; similarly Žukov (1965) recorded 14–17 ones. Rolik and Rembiszewski (1987) however gave slightly wider range: from 16 to 19.

In ventral fin the number of soft rays in the material studied was constant and amounted to 8. Žukov (1965) stated 8 and 9 rays, while Rolik and Rembiszewski (1987) recorded 7–9 range. Similarly, in dorsal fin the present authors found constant count of soft rays equalling 8.

The results of obtained by Kompowski (1971a) from the fish of the same water body differ from our own results, too. Scales number formula according to Kompowski (1971a) is as follows:

$$68\text{–}77\frac{13\text{–}15}{9\text{–}12}$$

while in our study:

$$(65)67\text{–}74\frac{(12)13\text{–}17}{(10)11\text{–}13}$$

Gill-rakers (sp. br.) in the blue bream are arranged in two rows. The authors citied above however gave only the number of gill-rakers in the first row. For example Kompowski (1971a) gave the range of 35–40 gill-rakers with the mean value of 37.08. In the presently studied sample wider range of gill-rakers in the first row was stated, namely 33–41 (mean 36.50). Even more similar mean value was given by Žukov (1965) for the fish from the river Dnepr—36.32 (range: 30–40), although the samples compared represented rather remote locality.

Mean number of vertebrae (vt.) in the population investigated amounted to 46.14, with the range of 41–48. Similar range was given by Žukov (1965): 40–46, with the mean value moderately lower (43.5). Rolik and Rembiszewski (1987) stated very narrow range, namely 47–48 vertebrae.

Formula of pharyngeal teeth (os. ph.) according to Rolik and Rembiszewski (1987): 5–5, 5–4, confirmed results in the presented work. However, neither specimens of the formula 5–6 (given by Žukov 1965) nor of 4–4 (Aleksandrova 1966) were found in the material studied.

Table 4

Comparison of variability range of selected meristic characters of blue bream studied with data available in literature

Area of study	Lake Dąbie		Vedlozero	Lake Ilmen	River Dnepr			Lake Dąbie	
Author and year	Kompowski (1971a)		Alekandrova (1966)	Titenkov (after Kompowski 1971a)	Žukov (1965)		Rolik and Rembiszewski (1987)	Present results	
Symbol of character	Range	$\bar{x}$	$\bar{x}$	$\bar{x}$	Range	$\bar{x}$	Range	Range	$\bar{x}$
D_m	8–9	8.07	8.00	8.00	7–9	8.02	7–9	8	8.00
A_m	35–42	38.14	40.00	39.30	35–42	38.00	34–44	31–41	36.96
P_m	—	—	—	—	14–17	15.75	16–19	14–18	16.20
V_m	—	—	—	—	8–9	8.03	7–9	8	8.00
l.l.	68–77	73.00	68.00	69.85	65–73	68.85	63–76	65–74	70.07
$l.l._s$	13–15	14.24	15.00	13.90	—	—	14–18	12–17	14.86
$l.l._i$	9–12	10.76	9.00	9.20	—	—	8–11	10–13	11.69
$sp.br._1$	35–40	37.08	38.00	34.58	30–40	36.32	35–44	33–41	36.50
vt.	—	—	—	—	40–46	43.50	47–48	41–48	46.14
os. ph	5–5	—	5–5, 5–4, 4–4	5–5	5–5, 5–6	—	5–5, 5–4	5–5, 5–4	—

Table 5

Analysis of significance of differences (test C Cochran and Cox) in metric characters between the populations from Lake Dąbie and the river Dnepr

Symbol of character	River Dnepr (Žukov 1965)			Lake Dąbie (present study)			C^0	$C_{0.05}$
	n	$\bar{x}$	S	n	$\bar{x}$	S		
metric characters—% *longitudo corporis*								
x_1	55	21.41	1.05	50	19.86	0.73	12.92*	2.01
x_{10}	56	52.07	1.70	50	51.51	1.64	1.73	2.01
x_{11}	56	40.80	1.77	50	40.66	1.38	0.44	2.01
x_{12}	56	31.10	1.66	50	34.68	1.25	12.66*	2.01
x_{13}	38	57.39	2.20	50	57.22	1.55	0.40	2.02
x_{14}	56	8.37	0.71	50	8.77	0.43	3.38*	2.01
x_{15}	55	10.79	1.01	50	11.65	0.78	4.96*	2.01
x_{17}	56	18.89	1.05	50	19.29	0.98	2.00	2.01
x_{18}	56	15.82	0.82	50	16.00	1.18	0.89	2.01
x_{19}	56	23.16	1.58	50	23.16	1.06	0.00	2.01
x_{20}	56	14.64	2.15	50	16.18	0.81	4.87*	1.94
x_{21}	56	9.62	0.82	50	10.47	0.67	6.01*	2.01
x_{22}	56	35.73	1.31	50	34.39	1.54	4.74*	2.01
x_{23}	56	18.64	1.46	50	20.81	1.19	8.20*	2.01
x_{24}	56	18.42	1.45	50	19.68	1.09	5.14*	2.01
metric characters—% *longitudo capitis lateralis*								
x_2	56	27.14	1.72	50	24.64	1.33	8.33*	2.01
x_3	56	26.73	1.65	50	24.89	1.35	6.13*	2.01
x_4	56	47.05	2.40	50	52.86	2.24	13.00*	2.01
x_5	56	78.60	5.54	50	82.61	5.09	3.77*	2.01
x_6	56	36.50	3.25	50	51.15	2.93	23.16*	2.01
meristic characters								
D_m	56	8.02	0.23	50	8.00	0.00	0.63	2.00
A_m	56	38.00	1.83	50	36.96	1.86	2.88*	2.01
P_m	39	15.75	0.67	50	16.20	0.86	2.60*	2.02
V_m	39	8.03	0.16	50	8.00	0.00	0.93	2.00
l.l.	38	68.85	2.05	50	70.07	1.97	4.68*	2.02
$sp.br._1$	53	36.32	2.73	50	36.50	1.77	0.40	2.01
vt.	50	43.50	1.45	50	46.14	1.20	5.55*	2.02

*difference statistically significant.

Tab. 5 demonstrates results of test C of Cochran and Cox, being used in order to analyse the significance of differences between populations from Lake Dąbie (present study) and the river Dnepr (Žukov 1965). The test showed the significant differences in 14 metric characters (in relation to the body length and lateral head length) and in 4 meristic characters.

The populations from Lake Dąbie and the river Dnepr differ significantly. The differences concerning the fish population of Lake Dąbie, between Kompowski (1971a) and the present authors seem to be explained by infraspecific variability.

CONCLUSIONS

1. The presently studied sample comprised of individuals of body length (l.c.) in the range of 28.0–35.0 cm. The mean length amounted to 31.78 cm. As much as 58% of the specimens represented the length class 31.1–33.0 cm.

2. Meristic characters of the examined population of the blue bream from Lake Dąbie can be described by the following formula: D III 8; A III (31) 33–39 (41); C VII–IX (X) 16–17 VI (VII); P I (14) 15–18; V II 8; l.l. $(65)67-74\frac{(12)13-17}{(10)11-13}$; sp. br.$_1$ (33) 34–39 (40, 41); sp. br.$_2$ (36) 38–47; r. br. 3; os. ph. 5–5 exceptionally 5–4; vt. (41, 44) 45–48.
3. Statistically significant differences were found in some biometric characters between population studied from Lake Dąbie and described in the literature population from the river Dnepr. Studies on the population inhabiting the lake indicated some differences in the results between Kompowski (1971a) and the present authors, what can be attributed to infraspecific variability.

REFERENCES

Aleksandrova I.S., 1966: O since Vedlozera [Blue bream of Vedlozera]. Tr. Karelsk. Otd. GosNIORCH, **4**, 1: 148–152. (In Russian).

Brylińska M. (ed.), 1986: Ryby słodkowodne Polski [Freshwater fishes of Poland]. PWN, Warszawa: 47–50. (In Polish).

Karabanowicz J., A. Kompowski, 1994: On biology of reproduction of blue bream *Abramis ballerus* (L. 1758) in the lower part of river Odra, Lake Dąbie and Szczecin Lagoon. Acta Ichth. Piscat., **24**, 2: 77–92.

Kompowski A., 1971a: Badania nad rozpiórem *Abramis ballerus* (L.) z jeziora Dąbie [Study on the blue bream *Abramis ballerus* (L.) from Lake Dąbie]. Zesz. Nauk. WSR w Szczecinie, **35**: 35–51. (In Polish).

Kompowski A., 1971b: Pokarm rozpióra *Abramis ballerus* (L.) w jeziorze Dąbie [Food of the blue bream *Abramis ballerus* (L.) from Lake Dąbie]. Zesz. Nauk. WSR w Szczecinie, **35**: 53–68. (In Polish).

Kompowski A., 1991: Catches and growth rate of *Abramis ballerus* (L. 1758) from Lake Dąbie and Firth of Szczecin. Acta Ichth. Piscat., **21**, 2: 17–28.

Krzykawski S., J. Szypuła, 1993: Ichtiofauna [Ichthyofauna]. In: Jasnowska J. (ed.), Stan środowiska miasta i rejonu Szczecina. Zagrożenia i ochrona [State of environment of the city and surroundings of Szczecin. Threat and protection]. Szczecińskie Tow. Nauk., Szczecin: 127–146. (In Polish).

Oktaba W., 1974: Elementy statystyki matematycznej i metodyka doświadczalnictwa [Elements of mathematical statistics and methodology of experiment]. PWN, Warszawa: 132–134. (In Polish).

Rolik H., M.J. Rembiszewski, 1987: Ryby i krągłouste [Fishes and cyclostomates]. Pol. Tow. Hydrobiol., Zesz. 5: 189–191. (In Polish).

Ruszczyc Z. 1981: Metodyka doświadczeń zootechnicznych [Methodology of experiments in animals husbandry]. PWRiL, Warszawa: 76. (In Polish).

Žukov P.I., 1965: Ryby Belorusii [Fish of Belorussia]. Izd. Nauka i Technika, Minsk: 282–287. (In Russian).

Stanisław *KRZYKAWSKI*, Katarzyna *BANIK*, Artur *ANTOSZEK*

CECHY BIOMETRYCZNE ROZPIÓRA *ABRAMIS BALLERUS* (L.) (CYPRINIDAE) Z JEZIORA DĄBIE

STRESZCZENIE

Celem badań było określenie zmienności cech wymierzalnych i przeliczalnych rozpióra *Abramis ballerus* (L.) pochodzącego z jeziora Dąbie. Ponadto zebrany materiał (50 ryb) opracowano pod kątem rozkładu długości ciała (l.c.).

Cechy przeliczalne badanej populacji można ująć w formułę: D III 8; A III (31) 33–39 (41); C VII–IX (X) 16–17 VI (VII); P I (14) 15–18; V II 8; l.l. $(65)67-74\frac{(12)13-17}{(10)11-13}$; sp. br.$_{1}$ (33) 34–39 (40, 41); sp. br.$_{2}$ (36) 38–47; r. br. 3; os. ph. 5–5 rzadziej 5–4; vt. (41, 44) 45–48.

Za pomocą testu C Cochrana i Coxa stwierdzono istotne statystycznie różnice w zakresie niektórych cech wymierzalnych i przeliczalnych pomiędzy badaną populacją z jeziora Dąbie a opisaną przez Žukova (1965) populacją z rzeki Dniepr.

Received: 2 December 1996

Authors' address:

Stanisław Krzykawski PhD DSc Prof
Katarzyna Banik MSc
Artur Antoszek MSc
Department of Fish Systematics
Agricultural University of Szczecin
Kazimierza Królewicza 4, 71-550 Szczecin, Poland