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Short communication

**THE ABSOLUTE FECUNDITY OF *VIMBA VIMBA* (L.) FROM LAKE
OSTROWIECKIE (ODER RIVER CATCHMENT AREA,
NORTHWEST POLAND)**

Piotr Hliwa, Andrzej Martyniak

University of Warmia and Mazury in Olsztyn, Poland

ABSTRACT. The fecundity of a local, stationary population of vimba bream *Vimba vimba* (L.) from Lake Ostrowieckie (Oder River drainage area, northwest Poland) was analyzed. The number of eggs in the ovaries was determined by the weight method. The individual absolute fecundity of vimba bream ranged from 9,560 to 157,000 eggs for females measuring from 19.2 to 34.0 cm and weighing from 121 to 693 g. Fecundity varied in the designated size classes from 21 thousand eggs for individuals below 22.0 cm to 104 thousand eggs for the largest ones (longer than 30.1 cm). The average fecundity in the youngest group of females (4+) was 25.6 thousand eggs, while that in the oldest group (9+) was 120.1 thousand eggs. Correlation analysis of absolute fish fecundity versus selected biometric parameters showed a significant dependence.

Key words: *VIMBA BREAM (VIMBA VIMBA)*, ABSOLUTE FECUNDITY, DRAWA/ODER CATCHMENT AREA

The population of vimba bream *Vimba vimba* (L.) in Lake Ostrowieckie, the largest reservoir in the Drawieński National Park, constitutes a part of the stock of this species which inhabits the drainage area of the Oder River and the rivers of Western Pomerania (Sych 1996, 1998). As the only anadromous cyprinid species, vimba bream is an unusually valuable representative of the native ichthyofauna. Furthermore, several years ago it was designated as a species in critical danger of extinction (Witkowski et al. 1999). Previous behavioral observations of the vimba bream under consideration in the present study (Hliwa 2000) and parasite analysis (Gomułka et al. 1999) indicate that this population is stationary and non-migratory. The high (approximately 90%) extent of trematode *Diplostomum* sp. and *Tylodelphys clavata* infestation (Nordmann) (Gomułka et al. 1999) and the absence of nematode *Anisakis simplex* (Rud.) larvae (Gomułka, unpublished data), which is common in the body cavities of sea fish, support the thesis that a local population exists.

The aim of this study was to determine the fecundity of vimba bream which has altered its reproductive behavior and formed a stationary, non-migratory population and to compare the results with those of migrating stocks.

Fecundity analyses were conducted on vimba bream females caught in Lake Ostrowieckie (Drawieński National Park) on 27 March and 28 April 1997 and 17 March and 30 April 1998. The study material was caught using gill-nets with a mesh size of 25 to 55 mm. Specimen body length (*longitudo corporis*) was measured to the nearest ± 0.1 cm, and body weight was determined to the nearest ± 1 g. Scales were collected from the females to determine their age, and then their ovaries were removed. A total of 63 females were caught. Body length ranged from 19.2 to 34.0 cm and weight from 121 to 693 g (Table 1). The number of eggs in the ovaries was determined using the weight method, as was applied and verified by Brylińska and Bryliński (1972). The ovaries were weighed to the nearest 1 mg, then samples of approximately 100 - 150 mg were collected from the head, mid and tail sections. The samples were preserved in a 2% buffered formaldehyde solution, and after several days the oocytes in each of the samples were counted. This step was repeated three times for each sample, and the results were averaged and recalculated into the eggs weight for the whole ovary. Correlation analysis was also done between the absolute fecundity and the selected, individual female features of body length and weight.

TABLE 1

Description of the material used to study the fecundity of vimba bream in Lake Ostrowieckie

Sampling date	Number of females	Body length (cm)			Body weight (g)		
		Range	Average	SD	Range	Average	SD
27 March 1997	15	22.2 - 34.0	26.4	2.98	166 - 693	336.4	13.7
28 April 1997	7	20.6 - 33.4	27.5	3.92	144 - 672	391.8	17.9
17 March 1998	16	19.2 - 29.1	22.0	2.61	121 - 490	202.1	93.4
30 April 1998	25	20.2 - 25.6	22.4	1.40	153 - 297	207.8	40.9

SD - standard deviation

All of the fish collected were sexually mature and between ages 4+ and 9+. Their ovaries were properly formed and no macroscopic, pathologic anomalies were observed. The eggs of the studied specimens were grey-olive green in color and fell into one of three size classes. Eggs with average diameters of 0.5 mm, 0.7 mm and 0.9 mm were found in the material. It was arbitrarily assumed that eggs with a cross-section smaller than 0.4 mm (about 5% of the total) comprise the oocyte surplus for the next reproductive season and were not included in the fecundity count.

The individual absolute fecundity of vimba bream from Lake Ostrowieckie ranged from 9,560 to 157,000 eggs. In the six designated size classes, the average fecundity varied from 21,000 to 104,000 eggs and in age groups from 4+ to 9+, it varied from 25,600 to about 120,000 eggs (Table 2).

TABLE 2

Size class (cm)	Age group						Average fecundity by size classes (thousands of eggs)
	4+	5+	6+	7+	8+	9+	
Below 22.0	18.4	23.7					21.0
22.1 – 24.0	32.8	32.6					32.7
24.1 – 26.0		50.5	56.1				53.3
26.1 – 28.0			67.7	57.2			62.4
28.1 – 30.0				77.3	108.0		92.6
Above 30.1					89.0	120.1	104.6
Average fecundity by age group (thousands of eggs)	25.6	35.6	61.9	67.2	98.5	120.1	

Correlation analysis between absolute fecundity and fish body length and weight was conducted for $n - 2$ degrees of freedom and at a level of significance of $\alpha = 0.05$, and it indicated that there is a significant dependence (Fig. 1).

Vimba bream spawn in spring and summer during which the females dispatch many small eggs of diverse diameters in several portions. This phenomenon is connected with the asynchronicity of oocyte size and maturity in the ovaries directly preceding reproduction (Brylińska and Długosz 1978). The comparison of preliminary results of vimba bream fecundity (Hliwa et al. 1999) with the confirmed results of the present study indicate that they correspond well with those obtained by Kaj (1958) and Iwaszkiewicz (1959), who estimated vimba bream fecundity in the Wełna River, which is geographically very close to the population from Lake Ostrowieckie, and with the results of Morawska (1964) for fish from the Vistula River system (Table 3).

The absolute fecundity was lower for Orawa vimba bream *Vimba vimba natio carinata* (L.), described by Wajdowicz (1974) and varied from 22,000 to 47,500 eggs. The results obtained do not vary from those presented by Vol'skis (1976) who calculated the fecundity of fish from the Dniepr, Kuban and Niemen rivers located in the former Soviet Union (Table 3).

The present study indicates that even five-year-old vimba bream females (aged 4+),

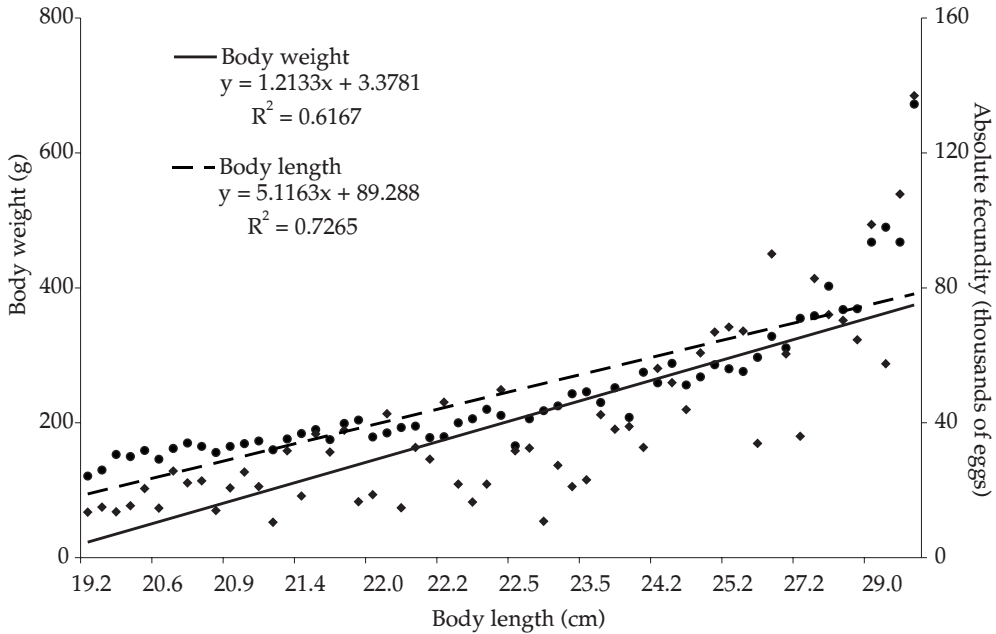


Fig. 1. Dependence between absolute fecundity and body length and weight for vimba bream females from Lake Ostrowieckie.

Absolute fecundity of vimba bream from different basins

TABLE 3

River or lake	Absolute fecundity (number of eggs)	Source
Węlna	80,000	Kaj (1958)
Czarna Orawa	22,000 - 47,500	Wajdowicz (1974)
Vistula	40,000 - 100,000	Morawska (1964)
Dniepr	11,400 - 136,400	Vol'skis (1976)
Kuban	28,100 - 90,900	Vol'skis (1976)
Niemen	30,700 - 75,500	Vol'skis (1976)
Lake Ostrowieckie	21,000 - 120,000	present paper

whose body lengths did not exceed 24 cm, are sexually mature. This may result in catches of fish which have not spawned yet and lead to decreased recruitment and lower reproductive potential in the primary stock. According to Pliszka (1953), vimba bream in Western Pomeranian rivers usually spawned twice in one season, and they began spawning almost simultaneously in connection with the aspects of sex gland

maturation. The stability of the hydrological conditions caused the reproduction period to be short and the dispatched eggs and hatched larvae were not endangered. However, according to histological analyses (Hliwa 2000), the vimba bream which inhabit Lake Ostrowieckie have an extended reproduction period that extends from the beginning of May until the first ten days of June, and they probably spawn in three portions similarly to fish which spawn in Latvian rivers (Sakun 1951). The cause of this behavior must be assigned to the progressively worsening environmental conditions for spawning and a change in reproductive behavior (the total lack of or a shortened spawning migration).

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STRESZCZENIE

PŁODNOŚĆ ABSOLUTNA CERTY *VIMBA VIMBA* (L.) Z JEZIORA OSTROWIECKIEGO
(DORZECZE ODRY)

Badana populacja certy stanowi część stad występujących w dorzeczu Odry i rzek Pomorza Zachodniego. Jako jedyny gatunek anadromiczny wśród ryb karpiowatych, jest niezwykle cennym przedstawicielem rodzimej ichtiofauny, objętym programem restytucji, a ponadto od kilku lat znajduje się na liście ryb krytycznie zagrożonych wyginieciem. W niniejszej pracy oszacowano płodność absolutną certy, która na obszarze Drawieńskiego Parku Narodowego wytworzyła populację stacjonarną (słodkowodną).

Ryby do badań pozyskano w latach 1997-1998. Ogółem złowiono 63 samice o długości ciała (*longitudo corporis*) od 19,2 do 34,0 cm oraz masie ciała od 121 do 693 g. Liczbę jaj w jajnikach obliczono metodą wagową (tab. 1).

Zakres indywidualnej płodności absolutnej certy wynosił od 9560 do 157000 sztuk ziaren ikry. W wyodrębnionych klasach wielkościowych płodność wahała się w przedziale od 21 tys. sztuk (dla ryb poniżej 22,0 cm długości ciała), do 104 tys. sztuk jaj (dla ryb największych, tj. powyżej 30,1 cm). W grupie samic najmłodszych (4+) średnia płodność kształtowała się na poziomie 25,6 tys. sztuk jaj, a w grupie ryb najstarszych (9+), wynosiła średnio 120,1 tys. sztuk (tab. 2). Dokonana analiza korelacji płodności absolutnej w zależności od masy i długości ciała ryb wykazała istotną zależność (rys. 1). Indywidualna płodność absolutna certy z Jeziora Ostrowieckiego jest zbliżona do wartości uzyskanych dla innych badanych populacji, m.in. z Wisły, Wełny czy rzek byłego ZSRR (tab. 3).

CORRESPONDING AUTHOR:

Dr Piotr Hliwa
Uniwersytet Warmińsko-Mazurski
Zakład Genetyki Ewolucyjnej
ul. Oczapowskiego 5
10-957 Olsztyn
Tel./Fax: +48 89 5234787; e-mail: phliwa@uwm.edu.pl