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CONTRIBUTION TO THE SYSTEMATICS OF THE GENUS OREOLEUCISCUS WARPACHOWSKI, 1889 (CYPRINIDAE)

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Abstract. The genus *Oreoleuciscus* Warpachowski, 1889 is divided by Berg (1949) into three species — *O. potanini* (Kessler, 1879), *O. pewzowi* (Herzenstein, 1883) and *O. humilis* Warpachowski, 1889. Kafanova (1961) and Svetovidova (1965) recently systemized these three species as only one, but did not give it a name. In this report based on morphometric analysis and on the meristic characters of 386 specimens, the authors concluded that Berg's division of the genus into three species was correct.

INTRODUCTION

Little is known of the Mongolian People's Republic from the ichthyological aspect (Dashdorzh, 1955). Some of the first material was collected by the expedition of the Czechoslovak Academy of Sciences in the summer of 1966, under Dr. Rosicky, head of the Department of Parasitology. Further material was collected in 1967, mainly by Ayuur Dulmaa. In all, 386 specimens of the genus *Oreoleuciscus* were caught and studied. This was necessitated by differences in the concepts on the systematics of this genus. Berg (1912) postulated the existence of the following species: *Oreoleuciscus potanini* (Kessler, 1879), *O. pewzowi* (Herzenstein, 1883), *O. recurviceps* Warpachowski, 1889 = *O. potanini* var. *recurviceps* (Warpachowski, 1889), *O. humilis* Warpachowski, 1889, *O. chorocephalus* Warpachowski, 1889, he included the species *O. dsapchynensis* Warpachowski, 1889 in the separate genus *Acanthorutilus* Berg, 1912. As distinct from this earlier study, in 1949 Berg distinguished only three species of the genus *Oreoleuciscus* — *O. potanini* (Kessler, 1879), *O. pewzowi* (Herzenstein, 1883) and *O. humilis* Warpachowski, 1889.

In a survey of the history of study of the genus *Oreoleuciscus* Ioganzen (1940), from measurements of 14 specimens, supposed the species *O. pewzowi* to be synonymus with *O. potanini*, but his studies were unfortunately limited to the drainage of the upper Ob in the U.S.S.R. Kafanova (1961) and Svetovidova (1965) doubted whether this genus was divided into separate species, however. They systemized all the species of this genus in a single species, but did not denote which. It is therefore necessary to start any revision of the systematical validity of each species of this genus with reference to the fundamental studies of Berg (1912, 1949), whose concepts are seen to be correct if we consider the geographical distribution of this genus as a whole.

MATERIAL AND METHODS

Material collected by Dr. Radim Ergens (Institute of Parasitology, Czechoslovak Academy of Sciences) in the summer of 1966, from whom we received 20 specimens, came from the localities numbered 3, 10 and 15 (see below), specimens, from all remaining localities were collected by members of the Mongolian Academy of Sciences and the material was studied partly in Prague and partly in Ulan-Bator.

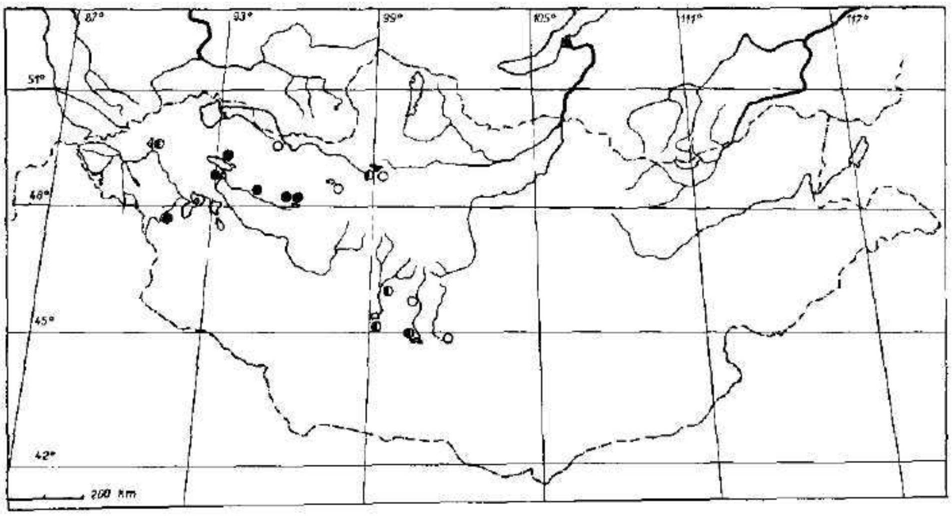

Fig. 1. Map of Mongolia showing the localities of the genus *Oreoleuciscus*. ● *O. potanini*, ○ *O. humilis*, ◐ *O. pewzowi*.

The localities were as follows:

1. Lake Airik	93°30′ E.L.	49° N.L.	7 spec. of *O. potanini*
2. Lake Dorgon	96° E.L.	48°30′ N.L.	7 spec. of *O. potanini*
3. Lake Khar	96° E.L.	48°30′ N.L.	60 spec. of *O. potanini*
4. River Khunguin	94°30′ E.L.	49° N.L.	30 spec. of *O. potanini*
5. River Buyant	91°30′ E.L.	48° N.L.	13 spec. of *O. potanini*
6. Lake Telmen	97°30′ E.L.	49° N.L.	58 spec. of *O. humilis*
7. River Tasarkhain	99° E.L.	49°30′ N.L.	23 spec. of *O. humilis*
8. River Tuin	101°30′ E.L.	45°30′ N.L.	22 spec. of *O. humilis*
9. River Tatsyn	102° E.L.	45°30′ N.L.	13 spec. of *O. humilis*
10. River Tes	94° E.L.	50° N.L.	1 spec. of *O. humilis*
11. River Baidarag	99°30′ E.L.	46° N.L.	60 spec. of *O. pewzowi*
12. Lake Bom Tsagan	99° E.L.	46° N.L.	63 spec. of *O. pewzowi*
13. Lake Achit	90°30′ E.L.	49°30′ N.L.	11 spec. of *O. pewzowi*
14. Lake Orog	101°30′ E.L.	45° N.L.	12 spec. of *O. pewzowi*
15. Lake Sangin Dalai	99° E.L.	49°30′ N.L.	6 spec. of *O. pewzowi*

According to Berg (1912, 1949), these localities all belong to the province of West Mongolia in the Upper Asiatic Subregion. The genus *Oreoleuciscus* is mentioned by Ioganzen (1947) as a typical representative of this province. In this territory there are numerous salt and freshwater lakes without outlets, connected in several cases by rivers which in desert country sometimes disappear underground and are lost. We thus encounter many separate drainage systems and this somethimes impedes the exchange of fish populations. It is therefore quite likely that the genus *Oreoleuciscus* is not monotypic in this region. For details on morphological features see Tab. I—IV (5 meristic and 16 plastic characters were studied). Dr. Juraj Holčík, CSc., of the Slovak National Museum Bratislava, studied the number of radial canals in scales of the genus *Oreoleuciscus*, with reference to its division into species (see Tab. V). From the material in Tab. V. we used the values related to specimens aged two years. Samples of the material have been deposited in the collection of the Laboratory of Ichthyology, Department of Zoology, Charles University, Prague.

Tab. I sums up the values of all the measurements in three individual species of Oreoleuciscus, irrespective of their place of origin. The visual differences seem to be greater than the metrical differences (expressed in the tables in numerical values) and are clearly evident in the photographs.

Table I. Measurements and counts in the genus *Oreoleuciscus* expressed in % of body length

Species	*Oreoleuciscus humilis*		*Oreoleuciscus pewzowi*		*Oreoleuciscus potanini*	
N	117		152		117	
	M	Range	M	Range	M	Range
Standard length	9.9—12.4	(6.1—15.1)	12.4—30.6	(8.8—36.6)	7.0—25.3	(4.5—29.6)
Head length	25.9—28.3	(21.7—31.7)	30.5—34.6	(22.2—39.8)	25.9—28.8	(24.2—32.0)
Preorbital distance	6.4— 7.9	(5.4—11.1)	7.8— 9.3	(5.7—11.7)	6.4— 7.9	(4.8— 8.7)
Length of mandibule	7.4— 8.4	(5.5—11.3)	9.5—11.2	(7.6—15.1)	7.5— 9.1	(6.0—10.6)
Length of opercule	9.5—10.3	(7.8—11.3)	11.3—13.1	(10.2—15.3)	8.3— 8.8	(7.6— 9.7)
Height of opercule	7.2— 7.6	(6.5— 8.2)	8.2— 8.7	(7.4— 9.2)	6.9— 7.9	(6.6— 8.5)
Postorbital distance	14.3—15.5	(11.2—17.7)	17.5—21.8	(14.7—25.5)	13.4—16.9	(10.3—19.5)
Length of cheek	5.3— 6.6	(4.4—10.1)	7.3—10.0	(4.4—13.6)	5.4— 7.5	(4.8— 9.3)
Max. body height	16.3—17.8	(12.2—21.0)	15.2—20.0	(10.5—24.4)	18.5—20.3	(13.4—29.0)
Min. body height	8.5— 9.4	(6.8—14.9)	6.9— 8.6	(5.5—12.2)	8.1— 9.5	(4.7—11.2)
Height of D	19.0—20.3	(14.4—23.5)	17.1—19.9	(12.0—22.3)	23.1—27.7	(18.2—31.7)
Length of caud. ped.	21.3—24.0	(16.1—27.4)	19.4—22.0	(16.4—25.2)	22.5—24.7	(20.0—28.3)
Predorsal distance	50.8—53.6	(45.2—62.0)	53.1—56.0	(45.0—64.0)	47.3—50.9	(40.0—54.6)
Postdorsal distance	36.1—39.9	(30.7—43.0)	33.7—38.8	(29.0—44.2)	39.1—42.6	(34.4—50.7)
Distance P—V	22.4—24.1	(17.9—28.1)	22.6—25.3	(17.4—31.1)	20.2—22.2	(17.2—25.3)
Length of P	15.6—16.5	(12.5—19.6)	15.3—17.0	(10.5—20.7)	15.2—16.8	(12.6—20.0)
Rays in D	7— 7	(7—7)	7— 7.2	(7—8)	8— 8	(8—8)
Rays in A	6.9— 7	(6—7)	7— 7.4	(6—9)	8— 8.3	(8—9)
Branchial spines	23—24	(21—28)	20—35	(17—42)	16.8—24.6	(14—38)
Perf. scales in l. l.	80.8—93.2	(72—107)	86.3—106.5	(73—114)	82.6—103.1	(71—117)

Table II. Measurements and counts in *Oreoleuciscus humilis* expressed in % of body length

Locality N	Telmen 58		Tasarkhain 23		Tuin 22		Tatsyn 13	
	M	Range	M	Range	M	Range	M	Range
Standard length	11.4	(8.3–14.5)	9.9	(8.4–10.8)	8.8	(6.0–11.3)	12.4	(8.8–15.0)
Head length	27.1	(21.7–30.0)	25.9	(25.0–28.7)	28.3	(25.3–31.7)	27.4	(24.0–29.1)
Preorbital distance	7.3	(6.0–11.0)	6.4	(5.4– 7.4)	7.9	(5.4– 9.4)	7.5	(6.8– 8.1)
Length of mandibule	8.4	(6.0–11.0)	7.4	(5.5–9.2)	8.2	(5.6– 9.0)	8.0	(7.1– 9.1)
Length of opercule	10.3	(9.1–11.3)	9.5	(7.8–10.4)	9.9	(9.3–10.6)	10.2	(9.7–10.8)
Height of opercule	7.5	(6.8– 7.7)	7.2	(6.5– 7.8)	7.3	(6.6– 7.9)	7.6	(7.4– 8.2)
Postorbital distance	14.7	(11.3–17.4)	14.3	(12.2–15.8)	14.5	(11.2–17.7)	15.5	(14.3–16.7)
Length of cheek	6.1	(4.5–10.0)	5.3	(4.5– 6.5)	6.1	(4.4– 8.3)	6.6	(6.0– 7.7)
Max. body height	17.2	(12.2–21.1)	17.3	(15.0–19.7)	17.8	(12.5–21.0)	16.2	(14.2–18.4)
Min. body height	8.8	(6.8–14.9)	8.9	(8.1–10.5)	9.4	(8.0–11.7)	8.5	(7.9– 9.6)
Height of D	19.1	(16.5–23.5)	20.3	(14.1–23.1)	20.0	(15.1–23.8)	19.7	(16.5–21.6)
Length of caud. ped.	23.5	(16.1–25.7)	24.0	(22.4–26.3)	23.6	(18.5–27.4)	21.3	(19.3–23.4)
Predorsal distance	53.6	(45.2–62.0)	51.7	(49.5–54.0)	51.9	(49.2–58.0)	50.8	(45.3–54.2)
Postdorsal distance	39.9	(33.0–42.7)	38.8	(36.0–43.1)	39.5	(36.6–43.0)	36.0	(30.7–42.0)
Distance P–V	22.4	(17.9–27.5)	24.0	(21.9–27.0)	24.1	(20.1–27.1)	23.0	(20.1–28.1)
Length of P	15.8	(13.1–18.1)	16.4	(14.0–18.6)	15.6	(12.5–19.6)	16.3	(15.1–17.6)
Rays in D	7	(7–7)	7	(7–7)	7	(7–7)	7	(7–7)
Rays in A	6.9	(6–7)	7	(7–7)	7	(7–7)	7	(7–7)
Branchial spines	26.3	(21–29)	23.4	(22–26)	33.4	(25–38)	34.4	(34–38)
Perf. scales in l. l.	88.1	(75–106)	93.7	(86–102)	80.8	(86–102)	89.8	(73–107)

RESULTS

Oreoleuciscus Warpachowski, 1889

Oreoleuciscus Warpachowski, Monografija novago roda karpovych ryb (Oreoleuciscus). SPb., 1889, p. 27, typus generis *Oreoleuciscus potanini*. Ann. Mus. Zool. Pétersburg, II, 1897, p. 263 (cited after Berg, 1912, p. 80, Berg 1949, p. 357).

Syn.: *Acanthorutilus* Berg, 1912, p. 81, typus generis *Oreoleuciscus dsapchynensis* Warpachowski, 1889, terra typica river Dsapchyn (= Dzavkhan), N.W. Mongolia.

Small or middle-sized fish (total length 5—35 cm, rarely up to 70 cm) (see Berg, 1912). Pharyngeal teeth uniserial, 5 —5, scales small, 72—11 4 in longitudinal series. Branchial spines 20—40 sometimes short, sometimes long. Head sometimes very large, flat robust and angular, with projecting lower jaw; in species with small, conical head lower law not projecting and mouth terminal in position. Operculum quadrate or triangular, dorsal fin high, with enlarged first undivided rays, especially the third (in which case the dorsal fin has the formula D III 8), or low, without thick first dorsal rays (in which case the dorsal fin has the formula D III 7—8). The anal fin is low, with the formula A III 6—9.

Sexual dimorphism is evident. The males have long ventral fins extending up to or beyond the anal papilla. They also have nuptial tubercles on the head and body surface and the urogenital papilla is very prominent (sometimes up to 5 mm. in length). In females the ventral fins do not extend as far as the anus, the urogenital papilla is hard to distinguish and the nuptial tubercles are absent. The coloration in formalin solution is dark brown on the back, varying in intensity, and pale on the belly; the whole body is sometimes coverd with dark spots and in this case belly is even paler. There are many intermediate forms between the various types of coloration.

According to Berg (1912, 1949), the genus *Oreoleuciscus* is distributed throughout the whole of the West Mongolian Province. According to our own experience, its range of distribution is from 88° to 100° (eastern longitude) and from 45° to 50° (northern latitude). Three species — *O. potanini*, *O. pewzowi* and *O. humilis* — were found in Mongolia.

Key to identification of species of the genus Oreoleuciscus

1 (2) — 8 soft undivided rays in dorsal fin, 8—9 in anal fin. Dorsal fin high, 23—28% of body length; first undivided dorsal rays thickened, especially third. Dorsal fin situated more dorsally (predorsal distance 47.4—51% of body length, postdorsal distance 39—42.6%). Operculum quadrate (length 8.3—8.8%, depth 7—8% of body length). Head length less than 30% of body length (26—28.8). Number of radial canals 7—14 (average 10.7). .... *O. potanini*

2 (3) — 7 or 8 soft rays in dorsal fin, 6—9 in anal fin. Dorsal fin short (17—20% of body length), without thickened undivided rays, and situated less rostrally (predorsal distance 53 to 56%, postdorsal distance 33.6—39%). Operculum elongated (length 11.3—13%, depth 8.2—8.8% of body length). Head large, robust and angular, over 30% of body length (30.5—34.6%). Radial canals 14—17 (average 15.9). .... *O. pewzowi*

3 (2) — 7 soft undivided rays in dorsal and in anal fin. Dorsal fin short, without enlarged first undivided rays; 19—20.3% of body length. Predorsal distance and postdorsal distance between those for *O. potanini* and *O. pewzowi* (51—53.5% and 36—40% of body length respectivelly). Operculum triangular and elongated as in *O. pewzowi*, though not so manifestly triangular in form. Length of operculum 9.5—10.3%, depth 7.2—7.6% of body length. Head slender and conical, 26—28.3% of body length. Radial canals 11—20 (average 14.2). .... *O. humilis*

Table III. Measurements and counts in *Oreoleuciscus potanini* expressed in % of body length

Locality	Airik		Dorgon		Khar		Khunguin		Buyant	
N	7		7		60		30		13	
	M	Range	M	Range	M	Range	M	Range	M	Range
Standard length	19.1	(9.3—31.1)	25.3	(21.5—29.6)	14.8	(5.1—28.0)	7.0	(4.5— 8.4)	7.9	(6.0— 8.8)
Head length	25.9	(24.6—27.2)	28.8	(26.8—32.0)	26.5	(25.2—29.9)	27.8	(24.1—34.1)	26.0	(24.3—27.2)
Preorbital distance	6.3	(6.2— 7.2)	7.9	(6.7— 8.5)	6.5	(4.8— 8.7)	6.8	(5.4— 8.7)	7.0	(5.7— 8.3)
Length of mandibule	8.2	(7.3— 8.6)	9.1	(8.2—10.6)	8.4	(7.1—11.0)	8.7	(6.3—11.3)	7.5	(6.0— 9.3)
Length of opercule	8.6	(8.5— 8.7)	8.3	(7.6— 8.9)	8.6	(7.6— 9.7)	8.8	(8.2— 9.5)	8.5	(7.6— 9.5)
Height of opercule	6.9	(6.6— 7.1)	7.5	(7.1— 7.8)	7.4	(6.8— 8.4)	8.0	(7.5— 8.5)	7.4	(6.9— 8.4)
Postorbital distance	14.7	(11.8—16.6)	16.9	(15.8—19.5)	14.6	(10.3—16.4)	14.4	(10.7—18.8)	13.4	(12.2—15.0)
Length of cheek	6.6	(5.6— 7.7)	7.5	(6.9— 9.3)	6.1	(4.8— 7.7)	5.4	(4.3— 7.5)	6.0	(5.0— 7.2)
Max. body height	19.9	(17.1—29.1)	18.5	(15.7—21.4)	17.9	(13.4—20.5)	20.3	(16.8—22.3)	19.6	(17.0—21.8)
Min. body height	8.6	(8.5— 8.8)	8.2	(7.4— 8.5)	8.1	(4.7—11.0)	9.5	(7.9—11.2)	9.5	(8.0—10.0)
Height of D	23.1	(18.2—26.6)	23.3	(20.4—28.5)	24.0	(19.7—29.7)	27.7	(23.1—31.7)	23.5	(21.8—25.3)
Length of caud. ped.	24.7	(21.8—25.8)	22.5	(20.1—24.2)	23.4	(20.7—26.5)	24.2	(20.0—26.7)	23.8	(21.5—28.3)
Predorsal distance	49.4	(47.1—52.3)	48.9	(40.2—53.4)	48.7	(41.1—54.6)	47.4	(43.7—53.1)	50.9	(45.9—54.6)
Postdorsal distance	42.6	(38.5—47.1)	39.1	(34.8—41.8)	41.7	(38.8—50.7)	42.2	(37.2—44.4)	41.9	(40.0—43.3)
Distance P—V	20.5	(17.7—23.8)	22.1	(21.0—23.0)	21.4	(19.0—23.6)	22.1	(19.6—25.3)	20.1	(17.2—21.8)
Length of P	16.4	(14.2—22.0)	15.6	(12.9—16.5)	16.4	(12.6—17.6)	16.8	(13.1—20.0)	15.2	(14.4—16.2)
Rays in D	8	(8—8)	8	(8—8)	8	(8—8)	8	(8—8)	8	(8—8)
Rays in A	8	(8—8)	8	(8—8)	3.3	(8—9)	8.2	(8—9)	8	(8—8)
Branchial spines	21.7	(17—27)	23.1	(22—24)	24.7	(17—37)	19.5	(14—22)	16.8	(14—18)
Perf. scales in l. l.	103.3	(90—109)	101.1	(96—110)	100.0	(83—117)	82.6	(71—103)	90.5	(76—102)

Table IV. Measurements and counts in *Oreoleuciscus pewzowi* expressed in % of body length

Locality	Baidarag		Bom Tsagan		Achit		Orog		Sangin Dalai	
N	60		63		11		12		6	
	M	Range	M	Range	M	Range	M	Range	M	Range
Standard length	12.4	(8.8–18.5)	22.9	(12.1–65.0)	30.6	(22.4–44.5)	21.6	(18.4–29.1)	30.0	(26.1–36.6)
Head length	30.5	(22.2–35.0)	30.8	(25.5–39.8)	33.3	(30.7–36.1)	34.0	(32.3–36.4)	33.3	(28.0–34.4)
Preorbital distance	7.9	(5.7–11.8)	7.9	(6.4–11.0)	8.6	(7.9– 9.3)	9.3	(8.2–10.2)	8.7	(7.2– 9.8)
Length of mandibule	9.5	(7.6–11.5)	10.6	(8.2–15.1)	11.2	(10.3–12.8)	10.6	(9.8–11.1)	10.7	(8.8–11.9)
Length of opercule	11.8	(11.1–12.6)	11.8	(10.2–13.4)	11.3	(10.7–13.4)	13.0	(10.6–15.6)	12.3	(11.3–13.9)
Height of opercule	8.9	(7.5– 8.8)	8.5	(7.4– 9.5)	8.2	(7.9– 8.6)	8.6	(7.8– 9.2)	8.5	(7.9– 9.1)
Postorbital distance	17.4	(14.7–21.8)	18.8	(15.2–25.5)	21.8	(18.6–24.1)	20.5	(17.5–21.8)	19.9	(15.3–21.6)
Length of cheek	7.3	(4.4–11.2)	8.2	(5.6–13.4)	10.0	(6.9–13.6)	8.7	(6.9–11.4)	9.2	(7.6–10.3)
Max. body height	17.0	(10.5–20.8)	15.2	(11.8–21.8)	20.0	(18.6–20.4)	19.1	(17.2–24.4)	19.1	(17.4–21.1)
Min. body height	8.6	(6.1–11.3)	6.9	(5.5–12.2)	8.3	(7.3– 9.3)	8.1	(6.9– 9.3)	8.0	(7.0– 8.8)
Height of D	19.9	(16.8–22.3)	17.1	(12.0–20.0)	20.0	(17.3–22.0)	18.4	(15.1–19.2)	18.9	(16.2–21.0)
Length of caud. ped.	22.0	(18.2–25.2)	20.4	(16.4–24.0)	19.5	(17.3–21.1)	19.4	(17.1–21.3)	20.6	(18.8–22.0)
Predorsal distance	53.1	(45.0–61.6)	53.9	(48.0–64.0)	55.2	(53.9–58.9)	56.0	(53.1–59.3)	54.1	(50.0–55.1)
Postdorsal distance	38.8	(30.9–44.4)	35.5	(29.0–41.6)	35.6	(32.1–41.3)	33.7	(29.9–37.3)	36.4	(32.4–38.9)
Distance P–V	24.7	(21.9–31.1)	23.1	(17.7–29.0)	22.4	(19.0–24.8)	25.3	(23.1–27.5)	22.6	(20.3–23.7)
Length of P	17.0	(10.5–19.2)	15.9	(14.4–20.7)	15.3	(12.9–16.5)	15.3	(13.1–16.9)	15.6	(13.7–17.3)
Rays in D	7.2	(7–8)	7.2	(7–8)	7.1	(7–8)	7.1	(7–8)	7	(7–7)
Rays in A	7.2	(7–9)	7.4	(6–9)	7.3	(7–8)	7.2	(7–8)	7.3	(7–8)
Branchial spines	35.8	(29–42)	33.9	(16–42)	19.5	(17–23)	34.1	(24–39)	21.1	(19–26)
Perf. scales in l. l.	86.3	(73–110)	95.7	(82–114)	104.5	(92–114)	95.4	(87–100)	100	(92–108)

There may be some difficulty in identifying small specimens of *O. pewzowi* and *O. humilis*, but the general impression of the two species is quite different; *O. pewzowi* has an angular head and the mouth appears larger, while *O. humilis* has a conical head and a small mouth.

Oreoleuciscus humilis

Small fish, body length up to 15 cm., head proportional to size of body. Operculum almost triangular. Dorsal fin short, without enlarged first undivided rays. Average number of radial canals 14.2 (for localization see Fig. 3).

The dorsal fin always has 7 divided rays and the anal fin always 7. The other meristic features are not suitable as key characters for identification (e.g. the number of branchial spines, the number of lateral line scales), as they concern all three species of the genus.

Sexual dimorphism is evident, as noted in diagnosis of the genus. In our material we found sexually mature specimens with a body length of only 5 cm.

Tab. II. gives locations and morphological characters. Average values are given in every case (range in brackets). Variability of all averages for all the key characters is only weakly evident in the table.

Oreoleuciscus potanini

The species in our samples measured up to 30 cm. The shape of the dorsal fin is very typical (manifest thickening of the undivided rays, especially the third). It clearly distinguishes this species from *O. humilis* and *O. pewzowi*. The head merges imperceptibly with the body (the profile is not angular), the mouth is small, the operculum is almost quadrate and the number of radial canals on the scales is small (average 10.7). The dorsal fin always has 8 divided rays and the anal fin always 8—9. Sexual dimorphism is the same as described for the genus. Sexually mature specimens with a body length of only 6—8 cm. were found (females from the river Khungui). Tab. III gives locations and morphological characters.

Oreoleuciscus pewzowi

The specimens in our samples measured up to 35 cm. The head is huge and angular, the mouth spacious. The operculum is triangular, the dorsal fin short, without thickened first undivided rays. Number of soft rays in dorsal fin 7—8, in anal fin 6—9. Average number of radial canals in scales 15.9. Sexually mature specimens found with body length of 15 cm. and over.

Table V. Number of radial canals in the genus *Oreoleuciscus*

Species	Age	Number of radial canals	
		M	**Range**
O. pewzowi	2+	15.9	(14—17)
O. potanini	2+	10.7	(7—14)
	1+ — 3+	9.7	(4—21)
O. humilis	2+	14.2	(11—20)
	1+ — 2+	13.1	(8—20)

The table was arranged in the same way as for *Oreoleuciscus potanini* and *Oreoleuciscus humilis*. The greater differences between the averages for individual features (e.g. head length in relation to body length — 13%) are due to inequality of the size of the compared features in different localities. Growth of the head is not proportional to growth of the body.

Tab. IV gives locations and morphological characters.

DISCUSSION

As mentioned in the introduction, Berg (1912) recognizes four species of the genus *Oreoleuciscus*, i.e. *O. potanini* (Kessler, 1879), *O. pewzowi* (Herzenstein, 1883), *O. humilis* Warpachowski, 1889 and *O. recurviceps* (Warpachowski, 1889). In addition he mentioned *O. similis* Warpachowski, 1889, described from a single specimen with broken fins. On the basis of our material, and as the "terra typica" of this species is not cited, we cannot comment on the validity of this species. Berg (1912) also mentioned the species *O. chorocephalus* Warpachowski, 1889, described by Warpachowski from a single head from lake Airik. From this locality we have only the species *O. potanini*. Lastly, Berg (1912) cited the species *O. dsapchynensis* Warpachowski, 1889, described from a single specimen from the river Dzavkhan in N.E. Mongolia and resystemized by Berg (1912) in the separate genus *Acanthorutilus* Berg, 1912. The river Dzavkhan originates in the Khangai Mountains and flows into Lake Airik. Our samples come from Lake Airik and contain seven specimens of *Oreoleuciscus potanini*. The same species was also caught in the river Khunguin (80 km. north of the Dzavkhan). The river Khunguin enters Lake Airik at the same place as the Dzavkhan. From this river we have 30 other specimens. In our total of 117 specimens of this species, in every specimen we found the enlarged (thickened) third undivided ray in the dorsal fin; this feature, together with the position of the dorsal fin in the middle of the body (predorsal distance = postdorsal distance) and some of the meristic characters (e.g. the number of rays in the dorsal and anal fins) are the same as those described by Berg (1912) for the genus *Acanthorutilus*. These findings inevitably raise doubts as to the authenticity of Berg's (1912) genus *Acanthorutilus*.

The genus *Acanthorutilus*, with the single species *A. dsapchynensis*, are not cited by Berg (1949), who in this study merely mentions *Oreoleuciscsu recurviceps* as a synonym ("variety") of *O. potanini*.

According to Berg (1912), the terra typica of "*O. potanini* var. *recurviceps*" is the river Naryn, a tributary of Lake Uvs in N.W. Mongolia. We have one specimen of *O. humilis* from the river Tes, which is also a tributary of Lake Uvs. This river flows about 25—50 km. north of the river Naryn. We cannot express a definite opinion on the validity of the species "*O. recurviceps*" or "*O. potanini* var. *recurviceps*" as described by Berg (1949).

O. humilis Warpachowski, 1889 is cited by Berg (1912) as coming from the following localities: Ulangom, the drainage of Lake Uvs, Koschagatsch, 88°30′ E.L., 50° N.L., the drainage of the upper Ob (the river Chuya in the U.S.S.R.). The nearest locality from which we obtained samples of *O. humilis* was the river Tes, 400 km. east of Koschagatsch; this river belongs to the same drainage as the river Ulangom (the drainage of Lake Uvs). The most eastern limit of this species (according to our samples) is the river Tatsyn, 102° E.L., 45° N.L. Its area of distribution is bounded to the north roughly by the 50th northern latitude and to the south by the 45th latitude.

O. pewzowi (Herzenstein, 1883) was known by Berg (1912) from the river Chon-kharikha the drainage of lake Khirgis and Khar-us. Our nearest locality was Lake Achit, 100—150 km. west of Lake Khirgis. We have 11 specimens of *O. pewzowi* from Lake Achit. Berg (1912) also know this fish from the river Taschenteli, a tributary of the Dzavkhan, and from Lake Kandy and Bust in N.W. Mongolia. According to Berg (1912) and our own findings, the area of distribution of *O. pewzowi* is bounded by the eastern longitudes 88° and 100°30′ and by the northern latitudes 45° and 49°30′.

O. potanini (Kessler, 1879) was known by Berg (1912) from the following localities: Dain-gol (Dayan-nur?), E.L. 89°, N.L. 48°30′, the river Chuya (a tributary of the upper Ob, U.S.S.R.), the river Chon-kharikha, the drainage of Lake Khirgis, which is connected with Lake Airik (we also have samples of *O. potanini* from Lake Airik), the river Kobdo (Khovd), about 50 km. north of Lake Dayan, the river Buyuntu (from where we have 13 specimens of *O. potanini*), Ulan-gom, the drainage of Lake Uvs, the river Argut, about 100 km. south of the river Chuya and the river Cheibok in the Altai Mountains in the drainage of the river Baskaus in the U.S.S.R. According to Berg's data (1912) and our own, the area of distribution of *O. potanini* lies between 88° and 96° E.L. and 48° and 50° N.L. Berg (1949) published a key for the identification of three species of the genus *Oreoleuciscus*, i.e. *O. potanini*, *O. pewzowi* and *O. humilis*. In 1949 he did not cite species which he enumerated in 1912. In addition to good diagnostic characters (the length and height of the operculum, the number of dorsal and anal rays), his 1949 key also includes features which cannot be used for the determined of the above three species, e.g. the number of branchial spines.

Ioganzen (1940), on the basis of measurements of 14 specimens of the genus *Oreoleuciscus*, assumed that it would be best to include the species *O. potanini* and *O. pewzowi* from the drainage of the upper Ob in a single species, *O. potanini*. *O. potanini* sensu Ioganzen (1940) inhabits the rivers Chulyshman, Bashkaus, Chuya and Argut. Ioganzen (1940) believed *O. humilis* to be valid species inhabiting the upper reaches of the river Chuya.

Kafanova (1961) thought it necessary to revise the genus *Oreoleuciscus* on the basis of material from the whole area of distribution of the genus. Her material is unfortunately limited to samples from the upper river drainage (the lakes and rivulets of the drainage of the rivers Chulyshman, Bashkaus, Chuya and Tuva). It is impossible to compare her material with our own, as she combined the whole of the material from the individual river systems and did not determine the species; this needs no comment. Svetovidova (1965) concluded that classification of the genus *Oreoleuciscus* into several species was untenable. She wrote that she had seen samples in the collection of the Institute of Zoology of the Academy of Sciences in Leningrad and the Zoology Museum of Moscow University, designated by previous collectors as belonging to three species: *O. potanini* (26 specimens), *O. pewzowi* (40 specimens), *O. humilis* (6 specimens). Her own material was collected in Lake Terekhol in the Tuva Autonomous Socialist Republic (244 specimens). She assumed that it all belonged to one species, but did not give the specific name. She ascribed morphological differences in her material to growth variability. Kafanova (1961) and Svetovidova (1965) — to us, incomprehensibly — did not use the important features given by Berg (1949), e.g. the length and height of the operculum. Our results likewise cannot be compared with those of Svetovidova, for the same reasons as in the case of Kafanova; Svetovidova also lumped all her specimens together. It is probable that both these authoresses had more than one species in their collections and this would explain why their results were so variable. Our own samples are sufficiently reliable, as they comprise 117 specimens of *O. humilis*, 117 of *O. potanini* and 152 of *O. pewzowi*, from almost the entire area of distribution of the genus *Oreoleuciscus*, and we can definitively conclude that the genus *Oreoleuciscus* is divided into three species, as demonstrated by Berg (1949).

SUMMARY

In all, 386 specimens of the genus *Oreoleuciscus* (117 of *O. humilis*, 117 of *O. potanini* and 152 of *O. pewzowi*) were studied in detail. The following features were used as diagnostic criteria: the number of undivided dorsal and anal rays, the depth of the dorsal fin, the predorsal and postdorsal distance, the length an height of the operculum, the head length and the number of radial canals in the scales. All three species of the genus *Oreoleuciscus* can be differentiated by these characters, according to the key previously compiled by us. We recognize the following areas of distribution for the three species in question:

Oreoleuciscus humilis: 88°30′ E L., drainage of the upper Ob, the river Chuya, 102° E.L., the river Tatsyn, 50° N.L., the river Tes, 45° N.L. the river Tatsyn;

Oreoleuciscus potanini 88° E.L., the river Chuya, the drainage of the upper Ob, U.S.S.R., Lake Dorgon, near Lake Khar 96°30′ E.L., the drainage of Lake Uvs 50° N.L., the river Buyant 48° N.L.;

Oreoleuciscus pewzowi: the river Chuya, the drainage of the upper Ob 88° E.L., Lake Orog 100°30′ E.L., again Lake Orog 45° N.L., Lake Sangin Dalai 49°30′ N.L.

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The plates will be found at the end of this issue.

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Der Zoologische Garten, Praha

VERLAUF DES HAARWECHSELS BEI EINIGEN HIRSCHEN (ARTIODACTYLA: CERVIDAE)

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Abstrakt: Es wird die topographische Sukzession des Haarwechsels bei erwachsenen Individuen der Arten *Cervus elaphus* Linnaeus, 1758, *Cervus nippon* Temminck, 1838, *Elaphurus davidianus* Milne-Edwards, 1866, *Dama dama* (Linnaeus, 1758), *Axis axis* (Erxleben, 1777), *Hyelaphus porcinus* (Zimmermann, 1780), *Rusa unicolor* (Kerr, 1792) und *Rusa equina* (Cuvier, 1823) beschrieben. Die Zusammenhänge mit der systematischen Verwandschaft der erwähnten Arten, sowie auch der Einfluss einzelner Futterkomponenten auf den Haarwechsel werden diskutiert.

Das Haarkleid der Cerviden ist im Sommer und im Winter verschieden. Das Sommerkleid besteht aus Grannenhaaren, die kürzer und weniger gewellt sind als die des Winterkleides; das Winterkleid hat längere, mehr gewellte Grannenhaare, die oft grosse Lufthöhlen besitzen. Bei den nördlichen Arten entwickeln sich im Winter noch Wollhaare, die weich und stark gewellt und hell gefärbt sind. Die in Tropen lebenden Arten entwickeln niemals die Wollhaare, selbst dann nicht, wenn sie in kalten Gegenden gehalten werden.

Bei dem periodischen Haarwechsel handelt es sich eigentlich um zwei Perioden: im Frühling wächst das neue Haar und das alte Haar fällt aus, die Wollhaare manchmal in ganzen Klumpen. Der Frühlingshaarwechsel ist deshalb sehr auffallend, mindestens bei den Hirschen der mässigen klimatischen Region. Im Herbst wächst das Winterhaar in das Sommerhaar ein und der Ausfall der Sommerhaare ist nur gering und unauffallend. Einige Sommerhaare können auch im Winter bestehen und nach einigen Angaben verdunkelt ihr Pigment (Miroljubov, 1936). An einigen Körperteilen (Kopf, Beine, Hals) können einige Sommerhaare das ganze Jahr bleiben, selbstverständlich durch das Winterhaar durchgewachsen.

Es wurden folgende Formen untersucht:

Cervus elaphus hippelaphus (Erxleben, 1777) — Europäischer Rothirsch
Cervus elaphus xanthopygus (Milne-Edwards, 1867) — Gelbsteisshirsch
Cervus elaphus bactrianus (Lydekker, 1900) — Bucharahirsch
Cervus elaphus asiaticus (Lydekker, 1898) — Altai-Maral
Cervus elaphus manitobensis (Millais, 1915) — Manitoba-Wapiti
Cervus nippon nippon Temminck, 1838 — Japanischer Sika
Cervus nippon dybowskii (Taczanowski, 1878) — Dybowski-Hirsch
Cervus nippon mantchuricus (Swinhoe, 1864) — Mandschu-Sika

Cervus nippon pseudaxis (Eydoux & Souleyet, 1841) — Vietnam-Sika
Cervus n. dybowskii × *C. n. taiouanus* (Blyth, 1860) — Sika-Hybriden
Elaphurus davidianus Milne-Edwards, 1866 — Milu-Hirsch
Dama dama dama (Linnaeus, 1758) — Damhirsch
Axis axis axis (Erxleben, 1777) — Axis-Hirsch
Hyelaphus porcinus annamiticus (Heude, 1888) — Hinterindischer Schweinshirsch
Rusa unicolor nigra (Blainville, 1810) — Indischer Sambar
Rusa equina malaccensis (F. Cuvier, 1824) — Malayischer Sambar

Es wurden hauptsächlich die Tiere in den Bedingungen des Zoologischen Gartens Prag, bzw. anderen Zoologischen Gärten, wie Tierpark Berlin, Zoologischer Garten Leipzig, Zoologischer Garten Liberec beobachtet, sowie die zahlreiche freigehaltene Herde der Dybowski- und Damhirsche im Zoopark Lešná. Die Resultate wurden durch die gelegentliche Beobachtungen in freier Wildbahn *(C. elaphus)* unterstützt.

Die Beobachtungen wurden in den Jahren 1959—1968 durchgeführt.

HAARWECHSEL EINZELNER ARTEN

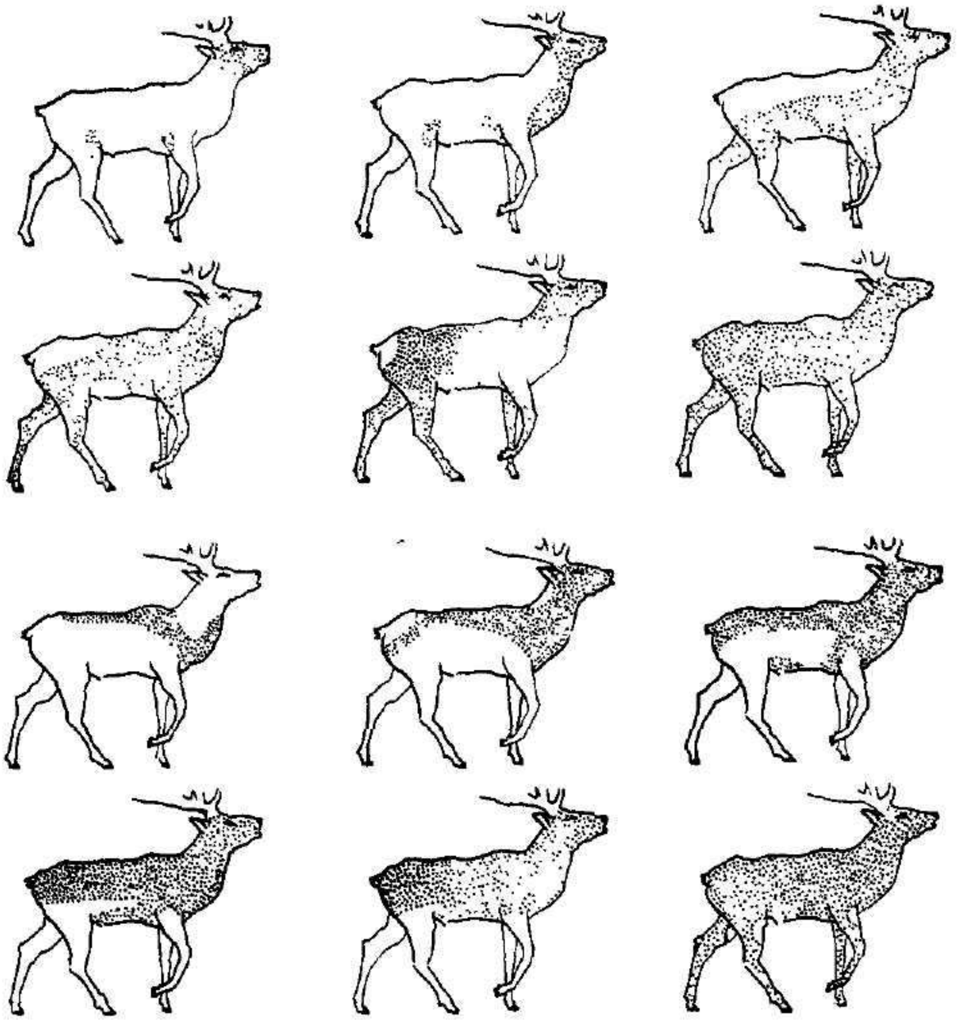
Cervus elaphus (Tab. 1)

Frühjahr-Haarwechsel: Er beginnt manchmal schon im Februar, wie es bei dem sehr altem Buchara-Hirsch des Prager Zoos oft der Fall war. In dieser Zeit wächst schon regelmässig das Sommerhaar auf dem ganzen Körper durch, ohne dass das Winterhaar auszufallen beginnt. Öfters beginnt aber der Haarwechsel erst im März. Es fallen zuerst die obersten Mähnenhaare und die Haare im Gesicht aus. Der Haarausfall ist am Beginn gering und unauffallend, so dass er in freier Wilbahn leicht übersehen werden kann. Im April beginnt ein auffallender Haarausfall, bei welchem die langen Mähnenhaare massenartig ausfallen und auf dem Halse das Unterhaar mit hell gefärbten Wollhaaren zu sehen ist. Gleichzeitig mit dem Hals und Gesicht erscheinen die Zeichen des Haarwechsels auf den Knien und Ellbogen. Der Haarausfall verbreitet sich an die Halsunterseite, auf die Körperseiten und geht langsamm an die Beine herunter und zum Rücken aufwärts. Am spätesten fällt das Winterhaar auf dem Bauch, in der Kreuzgegend und im Spiegel und hauptsächlich auf dem Widerrist aus; auf der letztgenannten Stelle bleibt das Winterhaar am längsten.

Nach 2—3 Monaten nach dem Haarwechselbeginn steht das Tier im vollen Sommerhaar. Die Hirsche wechseln das Haar schneller als die Hindinen. Hauptsächlich bei trächtigen Weibchen verlängert sich der Haarwechsel und kann nach der Kondition und Alter des Tieres in einzelnen Fällen bis nach der Geburt des Jungen enden.

Herbst-Haarwechsel: Das Winterhaar beginnt schon Ende Juli oder Anfang August aufzuwachsen und durch das Sommerhaar erkennbar zu sein. Der Ausfall der Sommerhaare ist gering und manche Sommerhaare wachsen weiter, so dass sie das ganze Jahr bestehen. Das gilt hauptsächlich für die Mähne, den Kopf und die Beine. Der Herbsthaarwechsel beginnt auf dem Rücken und auf der Halsunterseite und verbreitet sich um den Spiegel und auf den ganzen Hals und Kopf. Dann beginnt das Winterhaar auf dem Bauch auszuwachsen und sich mit der Winterhaare auf den Brustseiten zu vereinigen. Als letzte haaren die Keulen und die Beine um. Die allerletzten Stellen, wo das Sommerhaar geblieben ist, sind kleine Flecken unter dem Knie und auf dem obersten Teil der Vorderseite der Vorderextremitäten.

Der Herbsthaarwechsel geht etwas schneller vor sich als der Frühjahr-Haarwechsel. Am schnellsten haaren die Hirsche um, die manchmal in der



Tab. 1. Schema der topographischen Sukzession des Haarwechsels bei *Cervus elaphus*. Oben: Fruhjahr-Haarwechsel; *unten:* Herbst-Haarwechsel.

Brunftzeit schon völlig ungefärbt kommen. Die Hindinen beginnen später mit dem Herbst-Haarwechsel und beenden ihn auch dementsprechend später.

Bei dem Buchara-Hirsch konnten wir feststellen, dass der Haarwechsel langsammer vor sich geht als z. B. beim Gelbsteisshirsch oder dem Altai-Maral. Die Buchara-Hirsche tragen regelmässig in der Brunft noch gemischtes Haar, ähnlich, wie die mitteleuropäischen Rothirsche. Das unterstützt die Angaben Flerov's (1952), dass die nördlichere Hirsch-Subspezien schneller das Haar wechseln. Interessant ist, dass sich dieser Unterschied durch die lange Gefangenschaftshaltung (bis 12 Jahre und auch bei F_1 und F_2) nicht ausgeglichen hat. Es muss sich also um recht tief verankerte Phänomene handeln. Es sei hier bemerkt, dass die Vergleichung bei ungefähr gleich alten Hirschen der genannten Unterarten durchgeführt wurde.

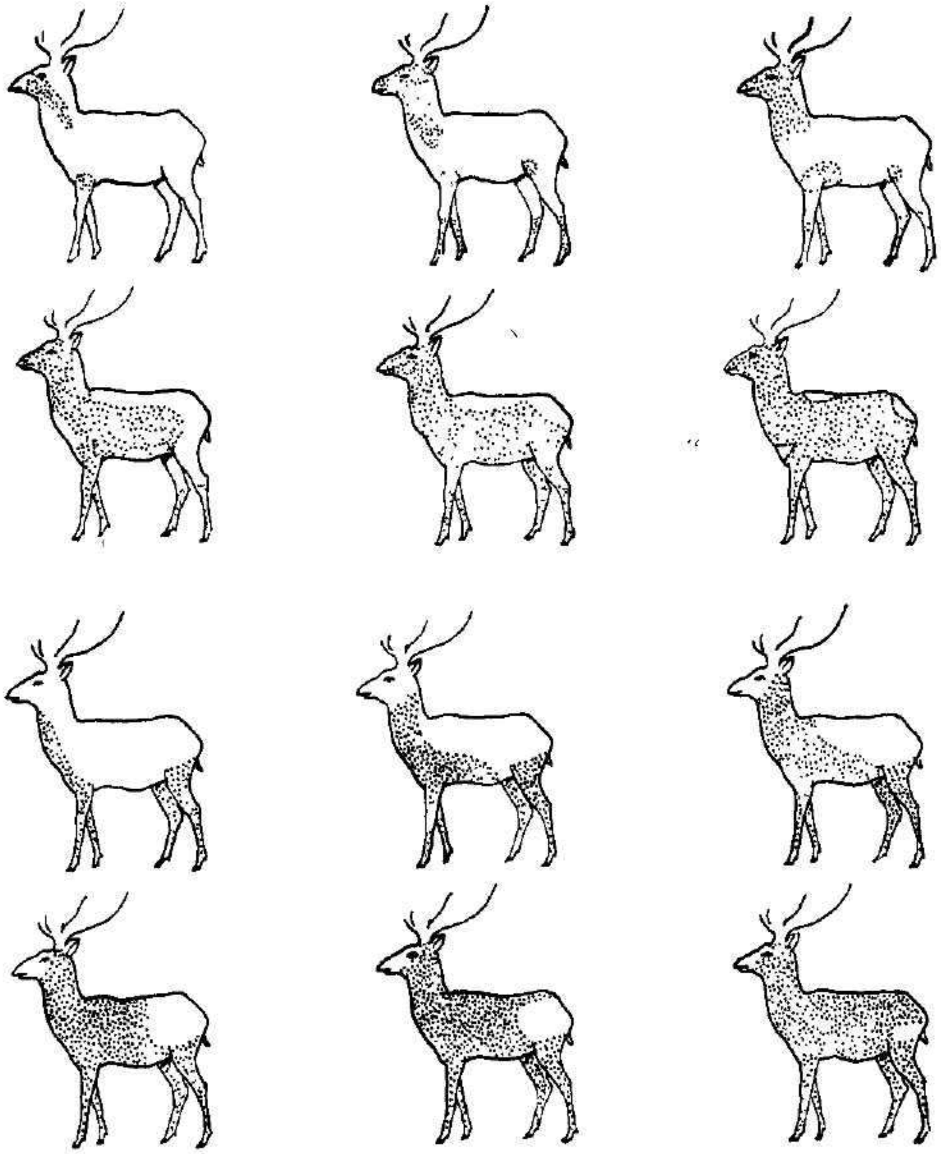
Der Schluss des Herbst-Haarwechsels der südlicheren Unterarten verläuft im Oktober—November. Es bestehen keine wesentlichen Unterschiede des Sukzession-Schema bei verschiedenen beobachteten Subspezien. Auch die vereinzelten Literaturangaben (z. B. Zalkin, 1946; Kaplanov, 1948; Flerov, 1952; Sokolov, 1959; Geptner, Nasimovič & Bannikov, 1961 u. a.) bestätigen nicht nur das Schema, sondern auch die Zeitangaben.

Cervus nippon (Tab. 2)

Frühjahr-Haarwechsel: Bei den Sika-Hirschen beginnt der Frühjahr-Haarwechsel meistens zu derselben Zeit, wie beim Rothirsch. Auch hier wächst das neue Haar im Februar aus, als das Winterhaar noch nicht ausfällt. Der Anfang des Haarausfalles findet regelmässig im März statt, nur ausnahmsweise schon Ende Februar. Auch die Dauer des Haarwechsels ist dieselbe, d.h. ungefähr 2—3 Monate. Die Sukzession des Frühjahr-Haarwechsels unterscheidet sich nur wenig von solcher bei *Cervus elaphus*, wie die beigefügten Figuren zeigen. Unterschiede kann man hauptsächlich im Haarwechsel der Läufe und der Halsunterseite finden.

Herbst-Haarwechsel: Desto interessanter ist die Feststellung, dass der Herbst-Haarwechsel bei dem Rot- und Sikahirsch einen ganz unterschiedlichen Verlauf hat. Während bei *Cervus elaphus* der Herbst-Haarwechsel grundsätzlich von der Rückenseite bauchwärts verläuft, beginnt er bei *Cervus nippon* auf der Halsunterseite und auf den Beinen und erstreckt sich von dort rückenwärts, er verläuft also ganz umgekehrt. Am spätesten haart der Kopf, wo einige Haare das ganze Jahr bestehen, und die Keulen um.

Der Herbsthaarwechsel beginnt im August—September und endet im November, manchmal erst im Dezember. Die Sikas tragen während des Haarwechsels das sogenannte „Herbstkleid" (Dobroruka, 1960), welches dadurch charakterisiert wird, dass durch das helle, gefleckte Sommerhaar ein dunkles, einfarbiges Winterhaar durchwächst. Die weisse Fleckung wird immer mehr und mehr zurückgedrängt und im vollen Winterhaar verschwindet sie, midestens bei den Männchen, völlig. Nicht immer fallen alle Sommerhaare aus, was wahrscheinlich Ilina (1956) zur Ansicht führte, dass beim Dybowski-Hirsch nur ein Haarausfall — im Frühling — stattfindet, während es sich im Herbst nur um das Aufwachsen neuen Haares handelt. Die Beobachtungen der Herde des reinblütigen Mantschu-Sikas, *Cervus nippon mantchuricus* (Swinhoe, 1864) im Zoologischen Garten Prag in den neun Untersuchsjahren haben in den milden Wintern öfters festgestellt, dass das „Herbstkleid" bis in Januar besteht. Das hat einige taxonomische Probleme der nordchinesischen Sikas gelöst, die z. T. schon früher (Dobroruka, 1960) diskutiert wurden: Die dunklen alten Hirsche in vollem Winterhaar entsprechen dem *C. n. grassianus* (Heude, 1884), die Hirsche, die im „Herbstkleid" geblieben sind, entsprechen dem *C. n. mandarinus* (Milne-Edwards, 1872). Schon Lydekker (1915) schrieb: "the type specimen of *mandarinus* having perhaps been killed before the winter coat was fully developed". Da wir wissen, dass der Holotypus am 1. Februar in Paris starb und nicht stärker gefleckt was als *hortulorum (= dybowskii)* (de Beaufort 1964), sich aber von diesem durch die Halsflecken und die rote



Tab. 2. Schema der topographischen Sukzession des Haarwechsels bei *Cervus nippon*. Oben: Frühjahr-Haarwechsel; unten: Herbst-Haarwechsel.

Farbe des Halses (Allen, 1940) unterschiedet, was sogleich typische Merkmale des *C. n. mantchuricus* sind (Dobroruka, 1960), können wir heute auch *mandarinus* als Synonym zum *mantchuricus* reihen.

Auch bei der Art *C. nippon* können wir die Angaben über die Unterschiede in Dauer des Haarwechsels zwischen nördlichen und südlichen Unterarten feststellen und bestätigen. Die Mandschu-Sikas und die Dybowski-Hirsche haarten schneller um als die Vietnam-Sikas oder die Hybriden Dybowski × × Taivan-Sikas, bei denen noch im Dezember oft die starke Fleckung erkennbar war. Auch Nakagawa (1963) gibt für *C. n. taiouanus*, *C. n. yakushimae*, *C. n. mageshimae* und *C. n. centralis* das Ende des Haarwechsels im November—Dezember an, während die Angaben Bromlej's (1966), Sokolov's (1959) und Geptner & Col. (1961) für *C. n. hortulorum* [= *C. n. dybowskii*] von der Dauer vom August bis Oktober sprechen.

Elaphurus davidianus (Fig. 3)

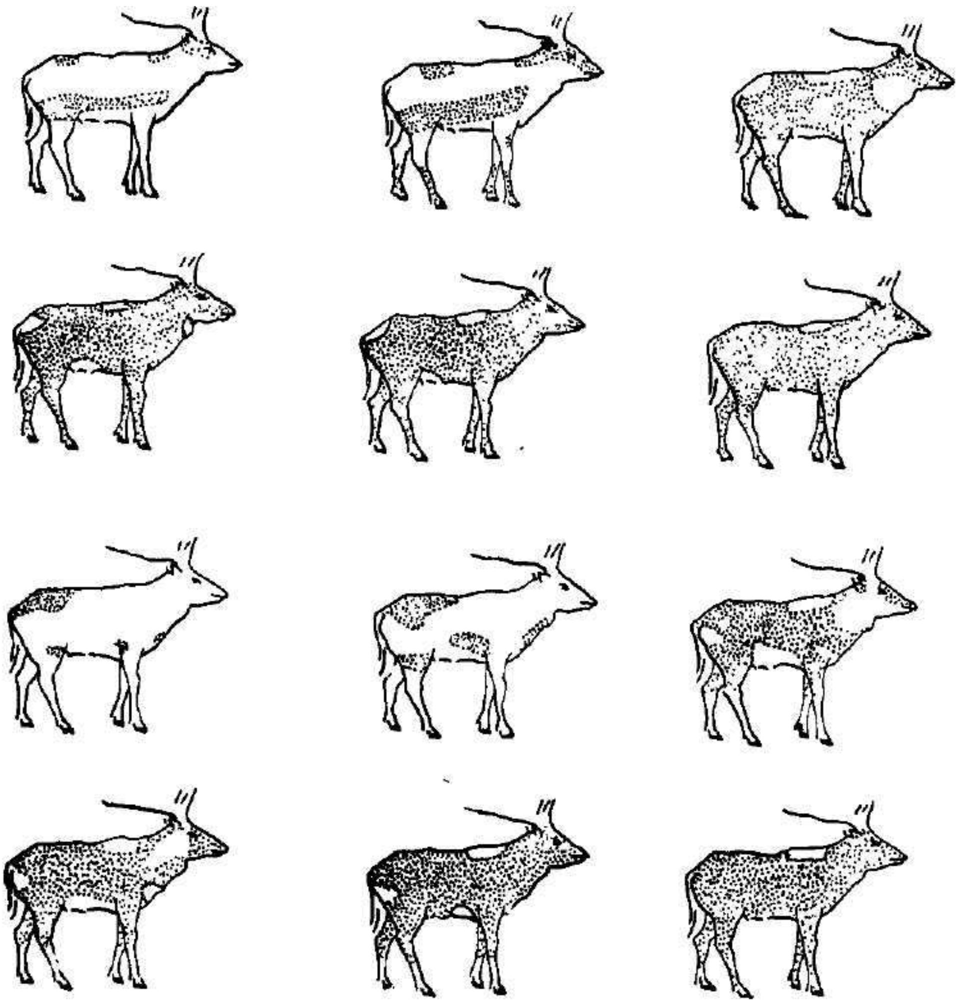
Frühjahr-Haarwechsel: Die Gattung *Elaphurus*, die sich von *Cervus* in vielen Merkmalen unterscheidet, hat auch einen völlig verschiedenen Haarwechsel-Verlauf. Im März, manchmal aber schon im Februar, beginnt die Umhaarung auf der Dorsalseite des Halses, auf dem Kopf, auf dem Hinterrücken und in einem Streifen von den Keulen bis auf das Blatt. Dann haaren die Beine um und der umgehaarte Streifen auf den Seiten erweitert sich bauchwärts und rückenwärts. Am spätesten haaren der Widerrist, die Kehle, die Schwanzwurzel und der Hinterbauch um. Die letzte Stelle, wo das Winterhaar am längsten bleibt, ist der Widerrist.

Der Frühjahr-Haarwechsel dauert ungefähr 2 Monate. Interessant ist, dass der Haarwechsel bei den Hirschen und bei den Hindinen nicht im gleichen Rhythmus vor sich gehen. Die Hirsche beginnen früher umzuhaaren als die Weibchen was auch bei anderen Arten der Fall ist, aber nach 10—14 Tagen, in einem Stadium, als noch fast der ganze Rücken und der Hals im Winterkleid stehen, kommt es zu einem Verlangsamen des Haarwechsels. In dieser etwa 14-tägigen Pause wechseln die Weibchen fast vollständig ihr Winterhaar und erst dann haaren die Hirsche schnell völlig um. Bei den alten Weibchen kann jedoch die Unterwolle auf den Körperseiten eine gewisse Zeit zerstreut bleiben.

Diese interessante Erscheinung konnten wir ganz regelmässig bei den Milu-Hirschen des Zoologischen Gartens Prag in allen 9 Beobachtungsjahren feststellen. Leider konnte ich diese Beobachtung auf anderem Material nicht überprüfen, denn ich konnte mir einen zweimonatigen Aufenthalt in anderen Tiergärten nicht leisten und niemand konnte mir zuverlässige Informationen über dieses Problem geben.

Herbst-Haarwechsel: Die Milu-Hirsche stehen im Sommerhaar ungefähr 3 Monate. Anfang August beginnt auf dem Hinterrücken das Winterhaar durchzuwachsen, dann wächst es auf den Knien, auf den Ellbogen und dem Halsansatz durch und erstreckt sich auf die Seiten und auf die Beine. Erst dann beginnt das Winterhaar auf dem Kopf durchzuwachsen. Die letzten Stellen der Umhaarung sind die Halsseiten, der Widerrist, der Bauch und die kaudale Seite der Keulen. Wie beim Frühjahr-Haarwechsel bleibt auch diesmal der Widerrist die allerletzte Stelle der Umhaarung. Der Herbst-Haarwechsel endet ungefähr Ende September.

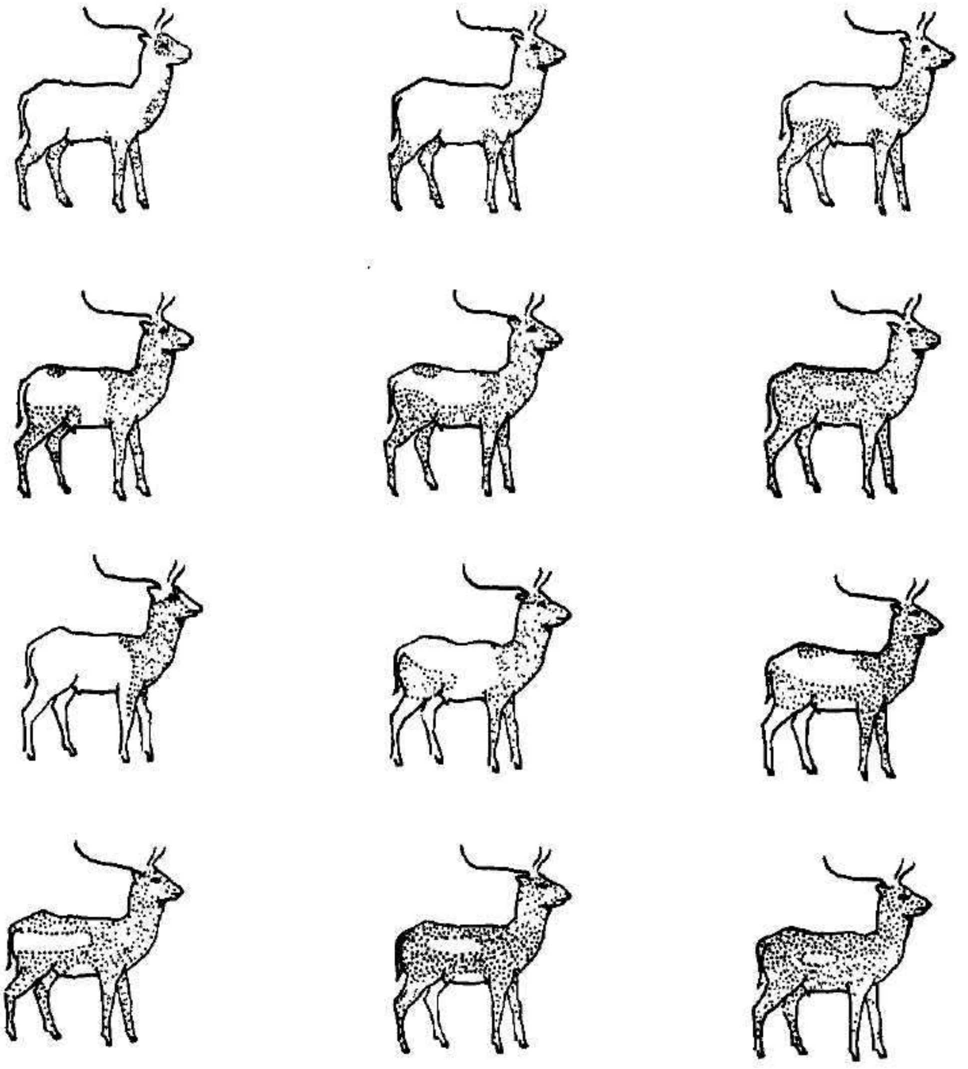
Im Jahre 1960 schob der sehr starke Prager Milu-Hirsch das Sommergeweih (siehe auch Mohr, 1962). Mit dem neuen Geweih begann der Hirsch auch mit der Umhaarung und beim Fegen des Sommergeweihs im Mai 1960 stand er wieder im Winterhaar. Es ist bei den Milu-Hirschen und ausnahmsweise auch bei anderen Hirschen bekannt, dass sie in einem Jahr zwei Geweihe tragen können. Meine Anfragen nach dem Haarwechsel in den



Tab. 3. Schema der topographischen Sukzession des Haarwechsels bei *Elaphurus davidianus*. Oben: Frühjahr-Haarwechsel; unten: Herbst-Haarwechsel.

Zoologischen Gärten, wo diese Erscheinung vorkam, konnten leider nicht beantwortet werden. Nur in der Arbeit Zukowsky's (1922), der die Entwicklung des Sommergeweihs bei einem Milu im Carl Hagenbeck's Tierpark in Stellingen im Jahre 1914 genau beschrieben hat, fand ich folgende Angabe: „In der achten Woche hat sich das Geweih zur vollen Grösse entwickelt. Der Hirsch ist im Haarwechsel.“ (*l. c.*, S. 123). Diese Angabe bestätigt also unsere Beobachtungen.

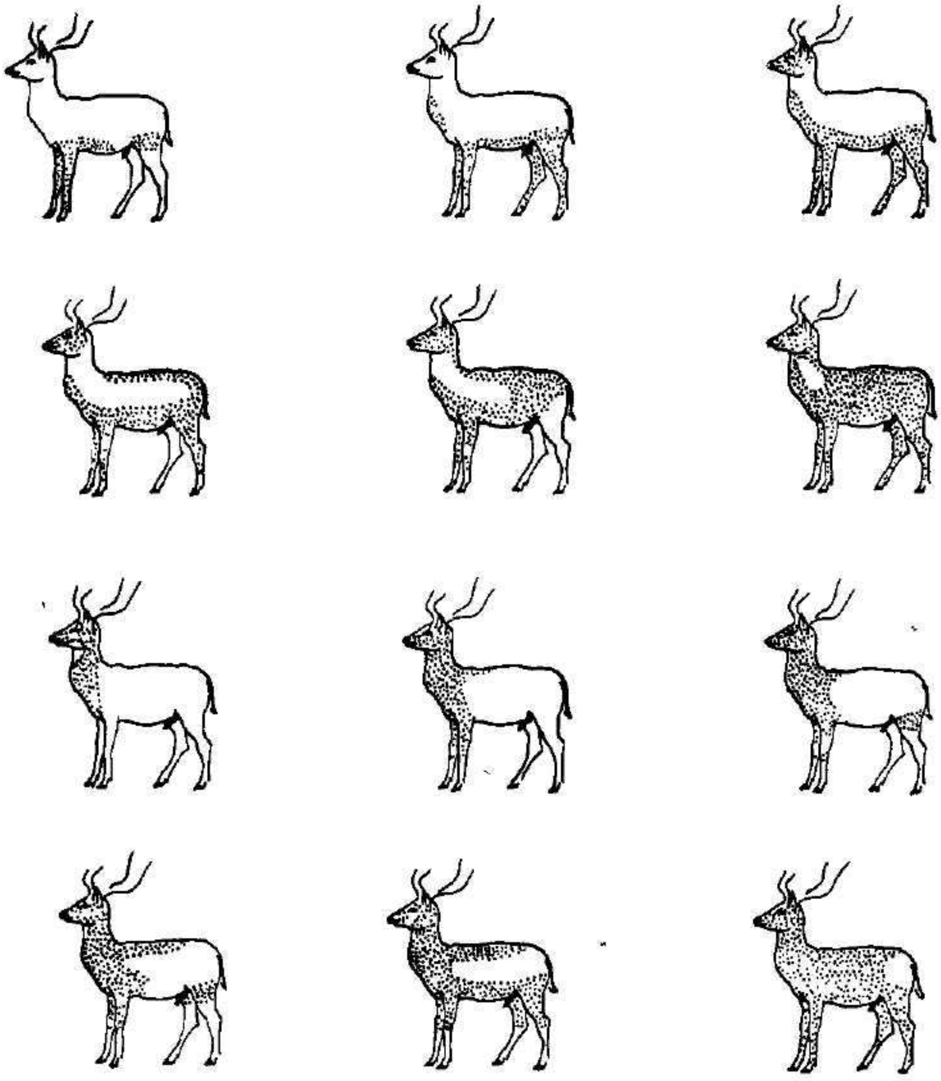
Es scheint, dass der Haarwechsel und die Geweihbildung eng zusammenhängen, d. h. dass diese Erscheinungen hauptsächlich physiologisch (hormonal) bedingt sind, und dass — mindestend bei den Hirschen — die endogene Faktoren wichtiger sind als die exogene, d. h. die Photoperiodizität oder die Temperatur.



Tab. 4. Schema der topographischen Sukzession des Haarwechsels bei *Dama dama*. Oben: Frühjahr-Haarwechsel; unten: Herbst-Haarwechsel.

Dama dama (Tab. 4)

Frühjahr-Haarwechsel: Schon im Februar ist das Herauswachsen des Sommerhaares durch das Winterhaar erkennbar. Der Ausfall des Winterhaares kommt aber erst im März vor, auf den Beinen, auf dem Hals und auf dem Kopf beginnend. Dann erstreckt sich der Haarwechsel auf die Keulen und die Schultern. Am letzten haaren die Seiten um, wo das Winterhaar noch im Juni zu beobachten ist. Wir sehen also, dass der ganze Haarwechsel auch bei dieser Art ungefähr 2—3 Monate dauert; nur ist die ganze Periode im Vergleich mit den bisher erwähnten Hirschen etwas verschoben



Tab. 5. Schema der topographischen Sukzession des Haarwechsels bei *Axis axis*, *Hyelaphus porcinus*, *Rusa unicolor* und *Rusa equina*. Oben: Frühjahr-Haarwechsel; unten: Herbst-Haarwechsel.

Herbst-Haarwechsel: Im September kann das neue Winterhaar am Halse stehen, wovon sich es auf die Vorderläufe erstreckt. Dann haart der Kopf um und eine Stelle auf den Keulen, die sich in Form eines Streifens an die Seiten zieht. Auf der Dorsalseite erstreckt sich das neue Haar vom Widerrist bis an die Kruppe und das alte Sommerhaar bleibt nur auf den Seiten und auf dem Bauch. Die letzte Stelle, die noch Anfang November im Sommerhaar stehen kann, ist das ovale, längsgestreckte Feld auf den Seiten. Der Herbst-Haarwechsel dauert also wieder ungefähr 2—3 Monate.

Axis axis, Hyelaphus porcinus, Rusa unicolor und *Rusa equina* *(Tab. 5)*

Bei allen diesen Arten verläuft der Haarwechsel mit so unbedeutenden Unterschieden, dass man über sie zusammen berichten kann. Es sei erwähnt, dass es sich um tropische Arten handelt, bei welchen die Wollhaare nur sehr gering oder gar nicht entwickelt sind. Der Haarwechsel ist deshalb nur schwer zu beobachten und die Einzelheiten kann man nicht feststellen.

Frühjahr-Haarwechsel: Er beginnt bei allen erwähnten Arten im März, wo das neue Haar auf den Vorderläufen, auf der Brust und in einem Streifen über die Keulen sichtbar ist. Dann erstreckt sich die Umhaarung auch auf Hinterläufe, auf dem Bauch und auf die Halsunterseite. Ungefähr Ende Juni steht der ganze Unterkörper, der Kopf und ein Rückenstreifen im Sommerhaar. Am letzten haaren die Halsseiten um und ungefähr Ende Juli ist die Umhaarung beendet. Der Frühjahr-Haarwechsel dauert also etwa 4 Monate.

Herbst-Haarwechsel: Schon im September kann man das Aufwachsen des Winterhaares auf dem Hals beobachten, was am deutlichsten bei den männlichen Sambarhirschen zu sehen ist, wo sich die Mähne bildet. Bald wächst auch am Kopf das Winterhaar durch. Das Sommerhaar bleibt hier aber auch, und es scheint, dass es an dieser Stelle überhaupt nicht ausfällt. Der Haarwechsel erstreckt sich auf die Brust, auf den Bauch und die Hinterläufe und lässt einen breiten Streifen von den Keulen bis an die Schultern frei. Am letzten haaren die Keulen um. Der Herbst-Haarwechsel dauert meistens bis Ende November, d. h. etwa 3 Monate.

VERLAUF DES HAARWECHSELS UND DIE TAXONOMISCHE VERWANDSCHAFT EINZELNER ARTEN

Im vorliegenden Beitrag wurden nur 8 Arten in 15 Subspezien behandelt. Weitere, bisher nicht beendete und ausgewertete Untersuchungen, die auch an Telemetacarpal-Hirschen durchgeführt wurden, unterstützen die Annahme, dass die Saisone-Änderungen des Haarkleides und das Haarkleid selbst (Haarstrich und Haarwirbel) ein sehr wertvolles Merkmal für die Taxonomie der Hirsche darstellen (cf. auch Mazák, 1962 beim Onager und Kiang). Diesem Problem wird noch eine speziale, umfangreichere Studie gewidmet werden.

Von den erwähnten Arten kann man den Axis-Hirsch, *Axis axis*, als den primitivsten Vertreter leicht erkennen. Das bestätigen nicht nur die Schädelmerkmale (lange Rosenstöcke, verlängerte Orbital-Region mit wenig heraustretenden Orbiten, wenig verschmälte Gesichtspartie usw.), sondern auch der primitive Typus der Färbung, die sommer- und winterlang immer gefleckt bleibt. Man kann also auch den Verlauf des Haarwechsels als primitiv oder mindestens als nicht zu weit spezialisiert ansehen. Dass auch die Arten *Hyelaphus porcinus*, *Rusa unicolor* und *Rusa equina* in gleicher Weise umzuhaaren pflegen, ist gar nicht überraschend, da alle diese Arten nahe verwandt sind und manchmal (z. B. Mohr, 1918) nur als Unterarten gleicher Art angesehen werden.

Desto interessanter ist die Feststellung, dass der Damhirsch, *Dama dama*, einen sehr ähnlichen Verlauf des Haarwechsels hat, wie die ersterwähnte Gruppe. Das bestätigt die Annahme, dass der Damhirsch näher den Sambaren steht als den Sika- oder Rothirschen. Wenn wir noch die Schädelmerkmale und das Haarkleid selbst (Haarstrich) zur Hilfe nehmen (Dobroruka, in litt), können wir eine Reihe *Axis* — *Hyelaphus* — *Rusa* (mit *Rucervus* und *Panolia*) — *Ussa* — *Dama* — *Przewalskium* zusammenstellen. Wahrscheinlich gehört in diese Reihe auch *Elaphurus*, der zwar manche hochspezialisierte Merkmale aufweist, aber doch eher mit den genannten Gattungen, als mit *Cervus* verwandt ist. Auch den Haarwechselverlauf kann man als eine spezialisierte Stufe in diese Gruppe einreihen.

Die zweite Gruppe der sogenannten echten Hirsche beginnt mit der Art *Cervus nippon*, in der ein Saisone-Dimorphismus in der Färbung entwickelt ist, und welche auch in den Schädel- und Geweihmerkmalen primitivere Merkmale gegen *Cervus elaphus* zeigt.

Wie schon oben erwähnt, verläuft der Frühjahr-Haarwechsel bei den beiden Arten im Prinzip übereinstimmend. Im Herbst dagegen verläuft der Haarwechsel bei beiden Arten verschieden. Bei *C. nippon* können wir im Herbst-Haarwechsel enige Merkmale der *Rusa*-Gruppe, d. h. primitivere Merkmale entdecken. Das bestätigt auch, dass die Sika-Hirsche den Rang einer Untergattung erhalten sollen. Bei der Art *Cervus elaphus*, zu der die höchst organisierten Hirsche gehören, soll auch der Haarwechsel-Verlauf die höchste Stufe erreichen. Deshalb kann man bei den Endgliedern beider Reihen, also bei *Elaphurus davidianus* und bei *Cervus elaphus*, einige Konvergenzen, wie z. B. im Prinzip den dorso-ventrale Verlauf des Herbsthaarwechsels, finden.

EINFLUSS EINZELNER FUTTERKOMPONENTEN AUF DEN HAARWECHSEL

In den Beobachtungsjahren wurde gleichzeitig der Einfluss einzelner Futterkomponenten auf den Haarwechsel untersucht. In keinem Falle konnte das Futter den Verlauf beeinflussen. Bedeutende Änderungen in der Zeitspanne des Haarwechsels konnten wir aber bei Mangel einzelner Futterkomponenten feststellen. Es ist bekannt, dass kranke oder in schlechter Kondition sich befindende Exemplare Störungen im Haarwechsel aufweisen und in schweren Fällen überhaupt nicht umhaaren. Eine Verlängerung des Frühjahr-Haarwechsels konnten wir aber auch bei den einzelnen Hirschen in bester Kondition feststellen, denen im Winter kein Gehölzverbiss zur Verfügung stand. Keine Zusätze von Vitaminen oder Spurelementen in Form eines üblichen Medizinalleckens konnten den Mangel an Verbiss ersetzen. Selbst gemahlene Eichen- oder Weidenrinde hatte keinen Erfolg. Als Verbiss hatten wir getrocknete Laubzweige (Pappel, Eiche, Hainbuche) und Fichten (unverkaufte Weihnachtsbäume) zur Verfügung. Während die Laubzweige immer gut gefressen wurden, zeigte das Wild für die Fichten nur am Anfang des Winters Interesse, wo auch die Rinde kahl geschält wurde. Ende Januar lehnten die Hirsche die Fichten ab. Es wurden Kontrollversuche mit Rot-, Sika-, Dam- und Rehwild, aber auch mit Bisons und Wisents durchgeführt. Die Tiere, die im Winter kein Verbiss hatten, verspäteten sich im Frühjahr-Haarwechsel bis um einundhalb Monat, obwohl sie sonst in einer ausgezeichneten Kondition waren.

Auch in freier Wildbahn ist beim Rothirsch im Winter eine erhöhte Abäsung der Nadelholztriebe bekannt. Es wurde angenommen, dass der Verbiss von Nadelholztrieben zu gewisser Zeit ein vermutlich notwendiger

Bestandteil der Rotwild-Nahrung ist, aber die Ursache solcher Erscheinung ist nicht bekannt (cf. Bubeník, 1959). Vermutlich spielt hier Kobalt, der dort erhalten ist, eine Rolle, was noch durch Versuche bestätigt werden müsste (siehe auch Lederer, 1968).

ZUSAMMENFASSUNG

1. Die nördlicheren Formen haaren schneller um als die südlicheren. Diese Eigenschaft ist so tief verankert, dass sie auch in weiteren Generationen, die in anderen Bedingungen gehalten werden, gut erkennbar bleibt.

2. *Dama dama* zeigt einen ähnlichen Haarwechsel wie die *Rusa*-Gruppe, was für die Verwandschaft mit den Sambaren mehr spricht, als für die Verwandschaft mit der *Cervus*-Gruppe.

3. *Elaphurus davidianus* wird als eine hochspezialisierte Art der *Rusa*-Gruppe angesehen, die Konvergenzen zu den hochspezialisierten Vertretern der *Cervus*-Gruppe, d. h. zu *Cervus elaphus* zeigt. Dagegen ist

4. *Cervus nippon* als ein primitiver Vertreter der *Cervus*-Gruppe anzusehen, der Konvergenzen zu der Gattung *Rusa* im Verlauf des Herbst-Haarwechsels aufweist.

5. Der Haarwechsel und die Geweihbildung sind zusammen verbunden und wahrscheinlich nur physiologisch (hormonal) bedingt. Es scheint, dass die endogenen Faktoren wichtiger sind als die exogenen, d. h. die Photoperiodizität oder die Temperatur.

6. Der Gehölzverbiss im Winter beeinflusst positiv die Dauer des Frühjahrwechsels.

SUMMARY

1. The moulting in the more northern forms proceeds faster than in the southern ones. This phenomenon is to observe even in further generations kept for a long time under conditions of captivity.

2. The moult in *Dama dama* resembles that of the *Rusa*-group. Therefore a closer relativity of *Dama dama* with the *Rusa*-group rather than with the *Cervus*-group is supposed.

3. *Elaphurus davidianus* is considered to be a high specialised species of the *Rusa*-group. The convergences with the high specialised members of the *Cervus*-group, i.e. with *Cervus elaphus*, were stated.

4. *Cervus nippon* is considered to be a primitive representative of the *Cervus*-group and shows convergences with the *Rusa*-group in the autumn moult.

5. The moult and the development of antlers are in close connection and are perhaps physiologicaly (hormonal) stimulated only. It seems that the endogenous phenomena are more important than the exogenous, e.g. photoperiodicity or temperature.

6. The browse in the winter period influences positively the lasting of the spring moult.

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A NOTE ON THE ROTIFER COLLOTHECA BREVICILIATA BERZINS

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Abstract: A description of the rotifer *Collotheca breviciliata*, based on the specimens found in Bohemia, is given and the differences between *C. edentata* and *C. breviciliata* are summarized.

Berzins (1951) described from S. Sweden *Collotheca breviciliata* (Fig. 2) and mentioned that the specimen figured by Frič and Vávra (1897) and designed as *Floscularia edentata* (Fig. 7) may belong to his new species.

Fott found in a peat-bog near Suchdol (S. Bohemia) a sessile rotifer preliminarily identified as *Collotheca edentata* Collins on Sept. 15th 1957. The rotifer was attached to submerged *Sphagnum*. Bartoš (1959) in the monograph of Czechoslovak Rotatoria recorded two localities of *C. edentata* Collins: Black Lake in the Bohemian Forest (Frič and Vávra) and the peat-bog near Suchdol (Fott), but his figure (Fig. 1) does not belong to these two records, but was taken over from literature and deals undoubtedly with the species *C. edentata* Collins.

When we compare Figs 2 (from Sweden), 4—6 (Suchdol) and 7 (Black Lake) and the descriptions, we see that these are only one species, *Collotheca breviciliata* Berzins. It is characterized by the facts, that the corona forms a complete ring without lobes and that the coronal margin is covered with an uninterrupted circle of very short cilia showing an equal length. The head is cylindrical, rather long. The cuticle of the head is ornamented with minute wart-like projections so that it seems to be dotted. The body is large and stout, foot is sharply separated from the oblong trunk. Extended foot is a little longer than the trunk. At the base of the foot as well as at its distal end there are two pairs of glands. The body is covered with a large gelatinous tube. The food consists (all quoted from Berzins, 1951) of diatoms, desmids and flagellates. Total length is 380—580 μm. In the littoral zone of several lakes in the Aneboda district it was found on *Utricularia*, *Myriophyllum* and *Equisetum*. The pH-value ranged between 5.8—7.0.

The differences between *C. edentata* and *C. breviciliata* are summarized in Tab. 1, modified from Berzins, 1951.

The specimen from Suchdol presented in Fig. 4 was an adult one showing a body length (without foot) 320 μm, length of extended foot 260 μm, so that the total length reached 580 μm. The width of corona was 130 μm, the width of the trunk 150 μm. A juvenile specimen (Fig. 6) showed a body

Tab. 1. Comparison of the features of *C. edentata* and *C. breviciliata*

Feature	*C. edentata* Collins	*C. breviciliata* Berzins
Body	large, stout	large, stout
Foot	of the same length as body, not distinctly separated	not much larger than body, sharply separated
Glands of foot	not known exactly, apparently none	two pairs
Peduncle	very short	long, with thread-like mediate part
Head	cylindrical, ornamentation not known	cylindrical, ornamented with small warts (dotted)
Corona	without lobes, annular, margin somewhat thickened	without lobes, annular, smooth
Cilia	short, longer on the dorsal and ventral parts; lateral very short, may be absent altogether	very short, of equal length, vibratile; in a thick, complete circle
Gelatinous tube	large, transparent, clean	large, transparent, clean
Length	317 – 462 μm	380 – 580 μm
See Figs	1, 3	2, 4, 5, 6, 7

length 180 μm, length of foot 75 μm, length of pedicel 36 μm, width of corona 90 and the width of the trunk 110 μm.

It is necessary to delete the species *C. edentata* Collins from the list of Czechoslovak rotifers and to replace it by the species *C. breviciliata* Berzins. This species is known up to the present time only from Sweden and Czechoslovakia (Berzins, 1967, and his personal letter of Nov. 28th, 1968).

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The figures will be found at the end of this issue.

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ZUR KENNTNIS VON RHINOLOPHUS BOCHARICUS KASTCHENKO ET AKIMOV, 1917 (MAMMALIA: CHIROPTERA)

VLADIMÍR HANÁK

Eingegangen am 15. Januar 1969

Abstrakt: Es wurde eine vollständige taxonomische Analyse aller wichtigen Merkmale von drei verwandten Arten der Gattung *Rhinolophus* vorgenommen, um die systematische Stellung der mittelasiatischen Form *Rhinolophus bocharicus* zu entscheiden. Zur Analyse wurden vor allem die Schädelmasse, die Zahnmerkmale und die Morphologie des Baculums benutzt. In der Arbeit sind auch Angaben über die Verbreitung, Ökologie und den Stand der Erforschung dieser Art zusammengefasst.

Rhinolophus bocharicus gehört zu den am wenigsten bekannten paläarktischen Fledermausarten, denn das Interesse für diese Art reichte, mit Ausnahme der Arbeit von Aellen (1959), nicht über den Rahmen der russisch geschriebenen Literatur hinaus. Sie wurde als selbständige Art erst im Jahre 1917 von den russischen Zoologen Kaščenko und Jakimov erkannt und beschrieben. Die enge Verwandschaft mit *Rhinolophus ferrumequinum*, einer weit verbreiteten und häufigen Art, führte schon kurz nach der Entdeckung zu der Anschauung, dass *R. bocharicus* nur als eine mittelasiatische Subspezies von *R. ferrumequinum* zu werten sei. So meinte z. B. Bobrinskij (1925) nach der Untersuchung von 50 Exemplaren, worunter sich auch das Material von Kaščenko und Jakimov befand, dass die neue Form nichts anderes als eine selbständige geographische Rasse von *R. ferrumequinum* sei. Diese Meinung wurde auch von Ognev (1928), sowie Ellerman und Morrisson-Scott (1951) übernommen. Sie wurde auch damit gefördert, dass aus Mittelasien keine Funde von wirklichen Grosshufeisennasen gemeldet wurden. Einige Jahre später ist Kuzjakin (1934, 1950) wieder zur ursprünglichen Anschauung von Kaščenko und Jakimov zurückgekommen, da ihm schon gemeinsame Fundorte von *R. bocharicus* und *R. ferrumequinum* aus Mittelasien bekannt waren. Ausserdem erkannte er auch schon einige deutliche morphologische Unterschiede zwischen beiden Formen (Grösse, Unterschiede in der Dentition usw.). In den letzten Jahren befasste sich mit dem Studium von *R. bocharicus* Aellen (1959), der auf eine nahe Verwandschaft dieser Form mit der nordafrikanisch-arabischen Art *Rhinolophus clivosus* Cretschmar, 1828, hinwies und dieselbe nur als eine Subspezies *R. c. bocharicus* ansah. Wir finden also in der diesbezüglichen Literatur mehrere abweichende Meinungen über die systematische Zugehörigkeit dieser Form, deren Klärung auf Grund einer ausführlichen und allseitigen Analyse der morphologischen Merkmale aller drei in Betracht kommenden Formen vorgenommen werden muss. Dies ist auch das Hauptziel der vorliegenden Arbeit.

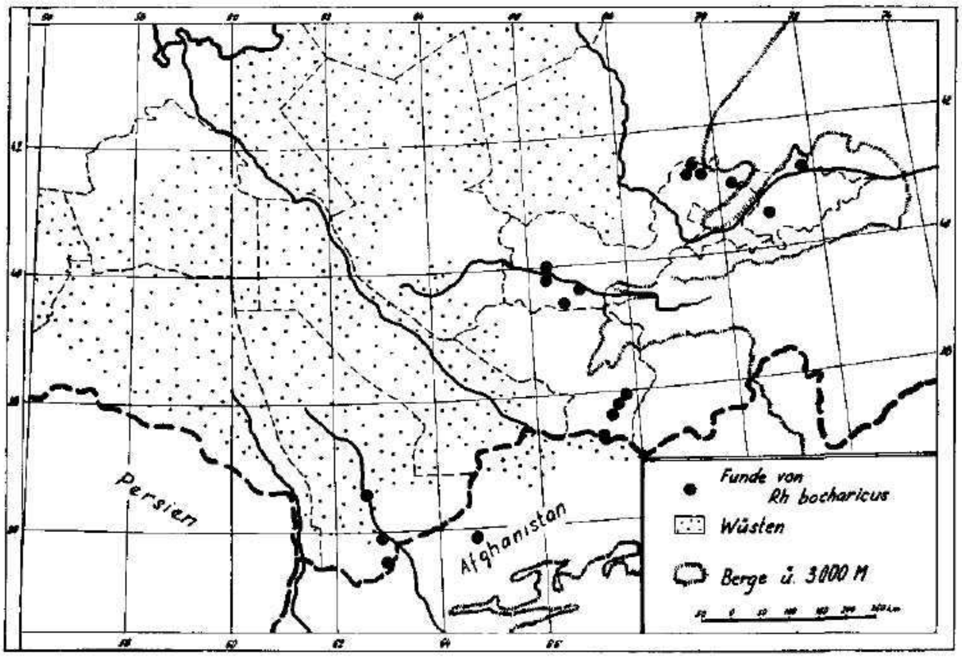
An dieser Stelle möchte ich Herrn Prof. A. P. Kuzjakin (Moskau) und Herrn Dr. A. K. Sagitov (Samarkand) für Ihre Hilfe beim Sammeln des Materials in Usbekistan, sowie den Herren Prof. Dr. V. G. Geptner und Dr. O. L. Rossolimo (beide Moskau), Prof. P. N. Meklenburzev (Taschkent), Dr. K. Bauer (Wien) und Dr. B. G. Corbet (London), die mir das Material aus den Museumssammlungen zugänglich machten, meinen Dank aussprechen.

MATERIAL

Die Grundlage meiner Untersuchung bildet eine Serie von 23 Stück (7 ♂♂ 16 ♀♀) *R. bocharicus*, die ich unter Beihilfe von Prof. Kuzjakin und Dr. Sagitov in der nahen Umgebung von Samarkand (Usbekistan) sammeln konnte. Die meisten Stücke dieser Serie werden in den Sammlungen des Instituts für systematische Zoologie der Karls-Universität in Prag aufbewahrt. Zusätzlich stand mir eine grossere Serie aus den Sammlungen des Zoologischen Museums der Staatsuniversität in Moskau (10 ♂♂ 11 ♀♀) aus Usbekistan und Turkmenistan und des Zoologischen Instituts der Mittelasiatischen Universität in Taschkent (4 ♂♂ 5 ♀♀) zur Verfügung. Das Material der licht gefärbten mittelasiatischen Subspezies von *R. ferrumequinum* stammt von meiner eigenen Sammeltätigkeit und aus den Sammlungen des Zoologischen Museums der Universität in Moskau (insgesamt 14 ♂♂ und 14 ♀♀) aus der Umgebung von Taschkent und Aschkhabad. Eine Serie von *R. clivosus brachygnathus* (21 ♀♀) ist aus den Sammlungen des Naturhistorischen Museums in Wien (Loc. Abd-el Quadir, Wadi Halfa, Sudan), dazu wurde ein ♂ derselben Subspezies von Abonarash, Kairo angeschlossen. Eine Serie von *R. clivosus clivosus* wurde in den Sammlungen des British Museums in London (5 ♀♀ 3 ♂♂) gemessen. Zu Vergleichszwecken konnten diejenigen Schädelmasse verwendet werden, die von einem Bearbeiter stammten, der mit gleichen Methode gemessen hat. Die Körpermasse sind bei den einzelnen Serien nicht in gleicher Weise entnommen worden und werden daher nur bei *R. bocharicus* als Ergänzung der gesamten Charakteristik dieser Art angeführt.

VERBREITUNG

R. bocharicus ist nach einer Serie von 49 Stück aus Termez (Südostusbekistan) und nach einem Stück aus Samarkand beschrieben worden. Eine weitere Fundstelle hat erst Bobrinskij (1925) angeführt, der 17 Stücke aus Taschkent gewonnen hat. Ognëv (1928) hatte 24 Stücke aus der Höhle Kon-i-gut in den Gebirgen Sarytau im Fergana-Gebiet und 2 Stück aus den Lösshöhlen am Ufer des Flusses Syrdarja aus der Umgebung von Taschkent zur Verfügung. Aus den Museumssammlungen kannte er Funde aus der Umgebung von Taschkent, Samarkand und aus dem Fergana-Gebiet. Kuzjakin (1934) entdeckte eine Kolonie von 30—40 Stücken in der Höhle Bolschaja Karakamyschskaja in der Umgebung von Taschkent und es gelang ihm dort 13 Exemplare zu sammeln. Später wurden noch weitere Fundstellen bekannt: das Tal der Flüsse Murgab und Kaschan (Südostturkmenien) und die Lösshöhlen im Tal des Flusses Surchan etwa 90 km nördlich von Termez (Bobrinskij, Kuzněcov, Kuzjakin, 1944). In einer weiteren Arbeit wird von Kuzjakin (1950) angeführt, dass sich in den Sammlungen im Zoologischen Museum des Instituts für Zoologie in Leningrad ungefähr 200 Stück dieser Art von verschiedenen Orten aus Mittelasien befinden. Unter der neuen Lokalitäten werden gennant: Kara-darja etwa 24 km nördlich von Katta Kurgan, Tachta Bazar (Südostturkmenien) und einige weitere Fundstellen aus dem Tal der Flüsse Murgab und Kaschan. Eine grosse Anzahl neuer Lokalitäten aus Usbekistan wird von Bogdanov (1950, 1953) angeführt. Dies sind ausser den bereits bekannten Fundorten weitere Funde aus dem Tal des Flusses Surchan, wiederholte Funde aus den Höhlen am Fluss Kara-kamysch in der Umgebung von Taschkent und besonders der Fund auf den Abhängen des Cchatokalrückens in 1200 m



1. Verbreitung von *Rhinolophus bocharicus* in Mittelasien.

Meereshöhe. Geptner (1956) beschreibt einige Funde aus dem Gebiet der Reservation von Badchyz in Südostturkmenien. In den neueren Sammelarbeiten von Sokolov u. Mitarb. (1963), sowie von Bobrinskij, Kuznecov und Kuzjakin (1965) wird nur die Gesamtverbreitung ohne konkrete Lokalitäten angeführt. Aellen (1959) gibt einen einzigen Fundort ausserhalb des Gebiets der UdSSR an, die Höhle Zarmast, Maimaneh in Nordafghanistan. Von mir selbst wurde diese Art im Oktober 1963 in der Umgebung von Samarkand gesammelt.

Alle bisherigen Funde zeigen also, dass *R. bocharicus* höchstwahrscheinlich eine Art mit dem kleinsten Verbreitungsareal unter allen paläarktischen Fledermäusen ist. Sie lebt nur in den Steppen und Halbwüsten von Südostturkmenistan, in einem grossen Teil von Usbekistan, wo sie nur in den nordöstlichen Gebieten fehlt, im westlichen Teil von Tadschikistan und vielleicht im gesamten nördlichen Teil von Afghanistan. Von der nächsten Art *R. clivosus* ist sie durch eine Lücke von fast 3000 km Breite getrennt.

BIOLOGISCH-ÖKOLOGISCHE BEMERKUNGEN

Die Lebensweise dieser Art haben Meklenburzev (1935), Kuzjakin (1950) und Bogdanov (1950, 1953) behandelt. Aus ihren Angaben ergibt sich, dass *R. bocharicus* zu den typischen Höhlen-Fledermäusen gehört; in Mittelasien bewohnt sie am häufigsten nicht allzu grosse Höhlen. Nach Meklenburzev sammelt sie sich oft in kleineren Kolonien von 20—30 Stücken, und nur ausnahmweise bildet sie, oft gemeinsam mit *Myotis*

Tab. 1. Körpermasse von ***Rhinolophus bocharicus*** und *Rhinolophus* ***clivosus*** *clivosus* (nach Harrison, 1964)

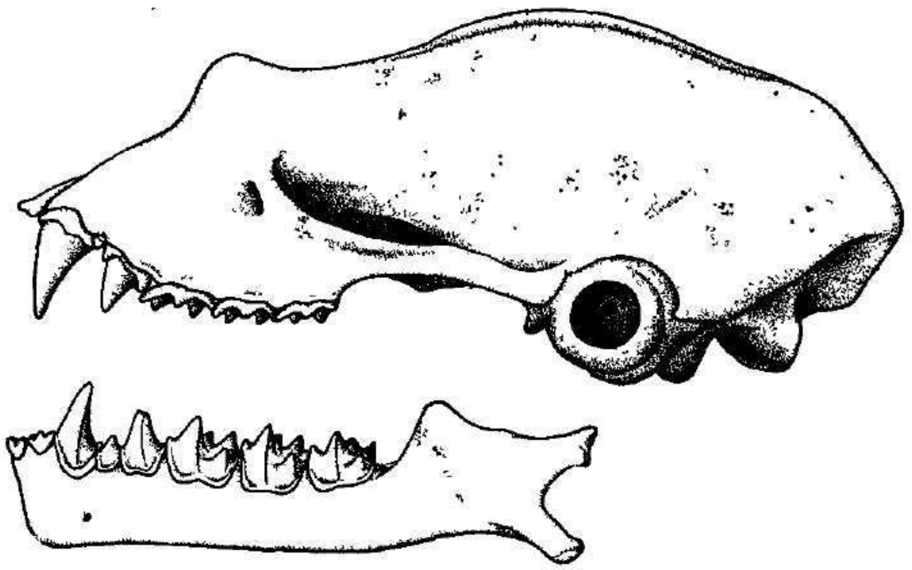
		K + R			Schw.			Ant.			Ohr		
		n		M	n		M	n		M	n		M
Rhinolophus bocharicus	♀	26	50,0–60,0	55,1	27	27,0–34,0	29,2	25	48,4–53,0	50,9	26	20,0–24,0	22,1
	♂	16	51,0–57,0	54,3	17	25,0–30,0	28,0	19	49,4–53,2	50,9	19	21,0–23,5	22,3
Rhinolophus cl. clivosus	♀	14	77,9–93,0	85,6	16	25,2–38,0	31,3	16	47,6–51,9	50,3	16	18,0–21,8	20,1
	♂	4	82,6–88,0	84,9	5	23,0–33,0	30,4	6	40,8–50,0	48,1	5	18,0–20,2	19,1

Tab. 2. Schädelmasse der vier verglichenen Formen der Gattung *Rhinolophus*

	CbL			GSchL			ZBr			IOB			MBr		
Rh. bocharicus	51	16,2–17,4	16,7	50	18,4–19,5	19,0	46	9,8–10,6	10,2	42	2,3–2,8	2,6	41	9,1– 9,5	9,3
Rh. cl. clivosus	7	16,8–17,6	17,1	7	19,0–19,7	19,3	7	9,8–10,3	10,0	7	2,1–2,8	2,3	7	9,0– 9,3	9,1
Rh. cl. brachygnathus	22	15,9–16,9	16,2	22	18,1–19,2	18,5	23	9,5–10,3	9,9	22	2,1–2,6	2,3	18	8,6– 9,1	8,8
Rh. ferrumequinum ssp.	19	18,7–20,3	19,5	19	21,2–22,2	21,8	19	10,8–12,1	11,6	18	2,2–3,0	2,7	16	10,0–10,4	10,2

	SchH			OZR			UZR			MandL					
Rh. bocharicus	41	7,1–7,6	7,3	42	6,6–7,2	6,9	45	7,2–7,8	7,5	44	12,3–13,3	12,8			
Rh. cl. clivosus				7	7,3–7,7	7,5	7	7,9–8,3	8,0	7	13,0–13,9	13,4			
Rh. cl. brachygnathus	18	6,7–7,5	7,1	23	6,7–7,3	7,0	23	7,0–7,9	7,6	23	12,3–13,3	12,6			
Rh. ferrumequinum ssp.	16	7,4–8,4	8,0	20	8,1–8,6	8,4	19	8,7–9,3	9,0	21	14,5–15,7	15,2			

emarginatus, grössere Gesellschaften von 150–200 bzw bis 800 Exemplaren (Ruinen von Termez). Kuzjakin betrachtet Kolonien von 200–300 Individuen als eine läufige Erscheinung; ausnahmsweise sollen auch Kolonien von etwa 600 Stück vorkommen. Auch die Meinungen uber den Zusammenhalt der Geschlechter in den Kolonien sind verschieden. Meklenburzev betont, dass die Kolonien immer aus den beiden Geschlechtern zusammengesetzt sind, während Bogdanov genauer beschreibt, dass sich die meisten Männchen während der Sommerperiode getrennt von den Wochenstuben aufhalten. Es wird sogar ein Solitärvorkommen der sich nicht vermehrenden Weibchen beschrieben. In den Herbstmonaten (September bis November) gibt es bei den Populationen von *R. bocharicus* Migrationen, die offenbar mit dem Aussuchen passenden Winterquartiere zusammenhängen. Zur Überwinterung werden nach Meklenburzev tiefere und dunkle Höhlen mit einer Temperatur von etwa +8° C in der Umgebung von Sommerquartieren ausgesucht; manchmal überwintern die Tiere auch in denselben Höhlen, wo sie im Sommer vorkommen. Die ursprungliche Vermutung Kuzjakin's (1950), dass die Populationen aus dem Tal des Flusses Surchan zwecks Überwinterung nach Afghanistan fliegen (auch Ellerman und Morrison-Scott haben dieses ubernommen), erscheint wenig wahrscheinlich. Der Autor hat es in seiner letzten Arbeit (1965) so formuliert, dass sie in der Richtung gegen Afghanistan „wegfliegen". Die Winterquartiere werden etwa Mitte April verlassen.

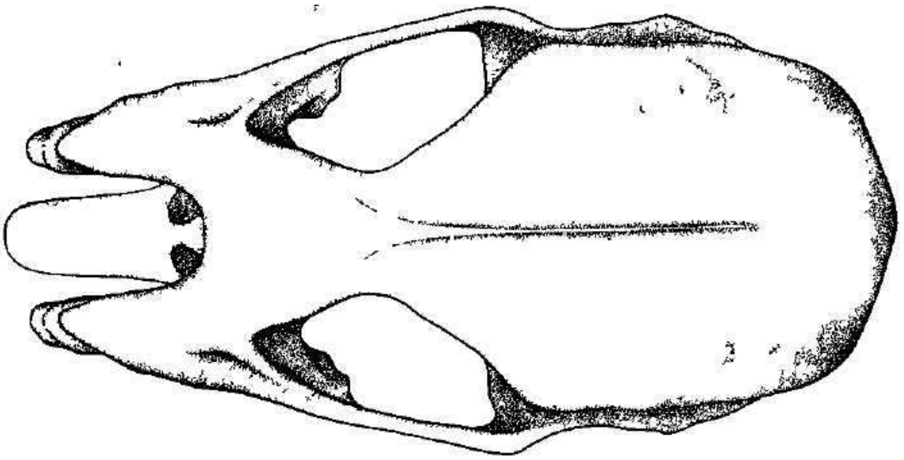


2. Seitenansicht des Schadels von *Rhinolophus bocharicus* (No. BB-4, ♀ad, Samarkand, 28. 9. 1963 leg. Sagitov).

Wahrend der Sommeraktivität fliegt *R. bocharicus* bei Einbruch der Dunkelheit zur Jagd aus, die Jagd wird gesellschaftlich in einem begrenzten Raum in Bodennähe betrieben. Die Abendjagd dauert ungefahr anderthalb Stunden, dann kehrt die Kolonie in die Höhle zurück und fliegt wieder gegen Morgen für etwa eine halbe Stunde aus. Die Geburten erfolgen in den Wochenstuben im Laufe des Juni und Anfang Juli. In der Nahrung überwiegen Lepidopteren.

TAXONOMISCHE ANALYSE

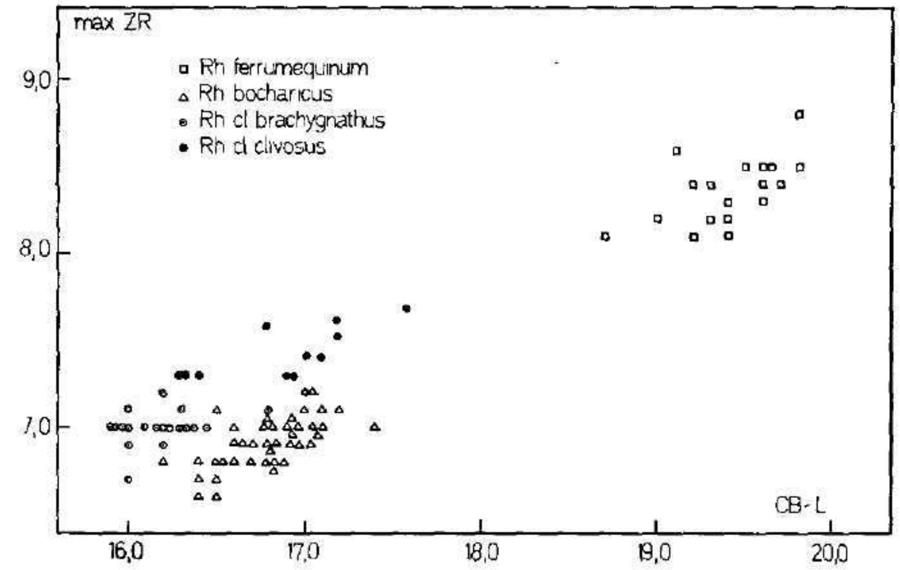
Färbung: *R. bocharicus* besitzt die charakteristische lichtblonde Wüstenfärbung, die noch blässer ist als die lichte Färbung von mittelasiatischen *R. ferrumequinum*. Das Fell ist auf dem Rücken deutlich zweifarbig, die Haarspitzen sind wenig ausgeprägt lichtblond und graulich, der übrige Haarteil ist lichter, fast weisslich (bei mittelasiatischen *R. ferrumequinum* haben die Spitzen der Rückenhaare einen rostbraunen Stich), die Unterseite ist auffallend heller, einfarbig weisslich mit einem undeutlichen lichtblonden Stich. Die Ohrmuscheln und der Nasenaufsatz sind nur wenig dunkler als die Farbe der Rückenseite, die Flughaut ist dunkelbraungrau, halbdurchsichtig. Bei den mittelasiatischen *R. ferrumequinum* ist der hintere Rand des Plagiopatagiums mit einem schmalen weisslichen Streifen gesaumt, was beim *R. bocharicus* fehlt. Die Färbung von *R. clivosus* konnte nicht an frischem Material beurteilt werden, nach den Literaturangaben soll sich die Färbung von *R. bocharicus* aber nicht wesentlich unterscheiden.



3. Oberansicht des Schädels von *Rhinolophus bocharicus* (No BB 4).

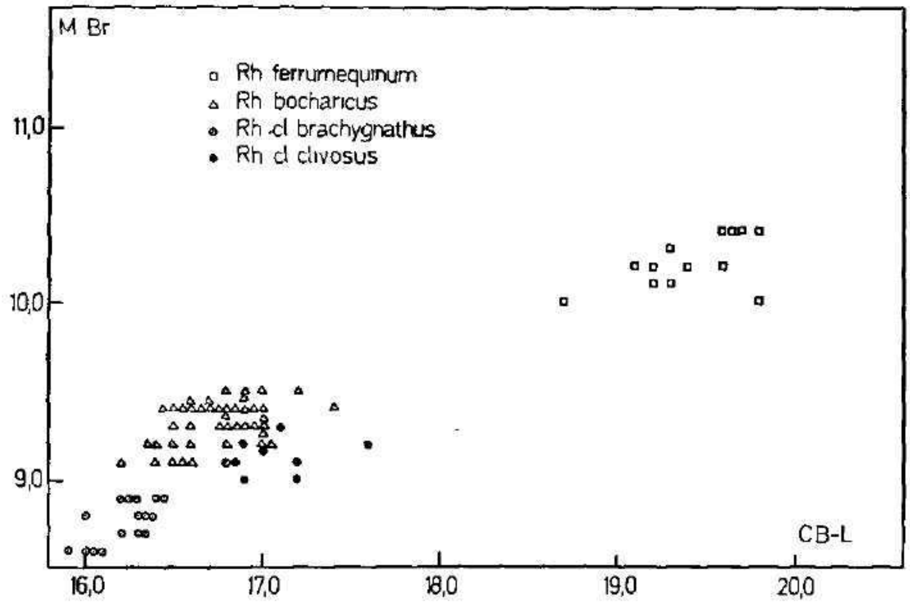
Der Nasenaufsatz: Im ganzen unterscheidet sich in der Form nicht von *R. ferrumequinum*, nur die Grösse ist unterschiedlich. Die grösste Breite des Hufeisens von *R. bocharicus* ist 6,2—7,0 mm, was der Angabe für *R. c. clivosus* (Harrisson, 1964 — 6,2 mm) entspricht; das Hufeisen von *R. ferrumequinum* ist wesentlich breiter (7,5—9,5 mm). Zum Vergleich des Detailbaues der hautartigen Nasenaufsätze der drei *Rhinolophus*-Arten stand kein passendes Material zur Verfügung. Die Ohrmuscheln von *R. bocharicus* unterscheiden sich in der Form nicht von *R. ferrumequinum*, sind aber kleiner und entsprechen der Ohrgrösse von *R. clivosus*.

Körpermasse: Die Körpergrundmasse von *R. bocharicus* verglichen mit den Massen von *R. c. clivosus* nach den Angaben Harrison's (1964),



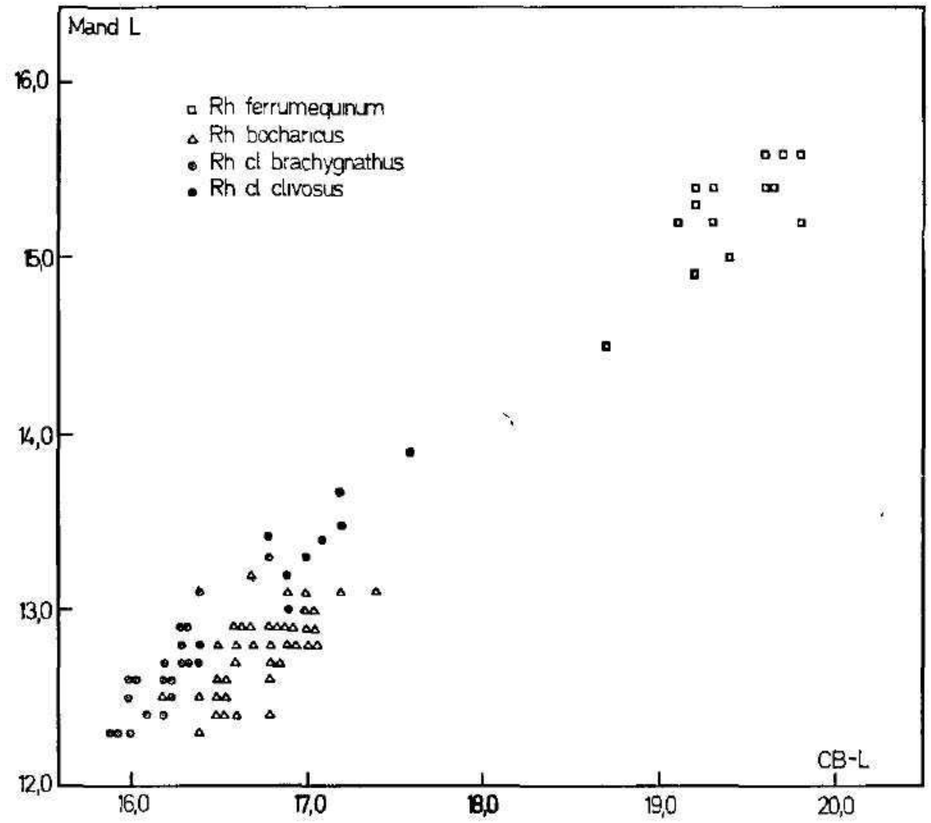
4. Die Beziehung der Condylobasallänge zur maxillaren Zahnreihe bei vier verglichenen Formen der Gattung *Rhinolophus*.

zeigt die Tab. 1. Angaben über die Körpermasse der kleinsten Form *R. c. brachygnathus* standen uns nicht zur Verfügung. Aus dem Vergleich ergibt sich, dass *R. bocharicus* im ganzen gleich so gross ist als *R. c. clivosus*; aller-



5. Die Beziehung der Condylobasallänge zu der Mastoidbreite bei vier verglichenen Formen der Gattung *Rhinolophus*.

dings sind die Unterschiede nicht kennzeichnend und haben für die Unterscheidung beider Formen nur wenig Bedeutung. Auch die Längeverhältnisse der Finger und besonders der Metakarpen sind bei diesen zwei sehr ähnlich. Bei *R. bocharicus* ist der vierte Metacarpus entweder gleich oder nur unbedeutend kürzer als der fünfte und um 2—3 mm länger als der dritte.

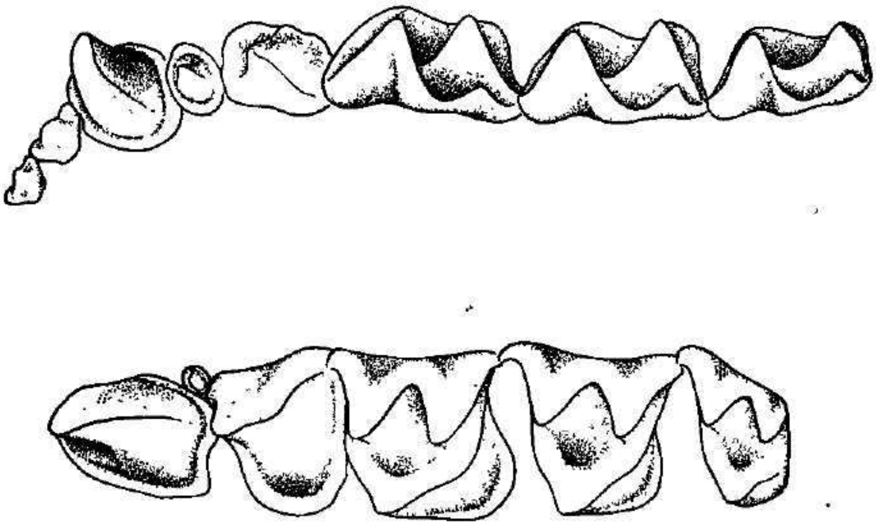


6. Die Beziehung der Condylobasallänge zur Mandibellänge bei vier verglichenen Formen der Gattung *Rhinolophus*.

Schädelmasse: Der Schädel von *R. bocharicus* (Abb. 2 und 3) ist in der Form und in den Proportionen sehr ähnlich dem Schädel von *R. clivosus*; bei beiden diesen Arten ist der Sagittalkamm nur undeutlich entwickelt. Die Schädelgrundmasse der vier verglichenen Formen (Tab. 2) bilden die wichtigsten Unterlagen für die taxonomische Analyse. Die markanten Unterschiede sowohl der absoluten als auch der relativen Werte (Abb. 4 bis 6) sind darin ganz deutlich. Besonders auffalend und bedeutend sind die Unterschiede in den Beziehungen einiger Schädelmasse aller vier verglichenen Formen (z.B. die Beziehung CB-L/maxZB im Vergleich mit CB-L/MastBr — Abb. 4 und 5). Ein deutlicher Unterschied zwischen bocharicus und beiden Formen von clivosus besteht auch in den absoluten Massen der interorbitalen Breite (Tab. 2). Zusammenfassend gesagt: *R. bocharicus* steht durch die

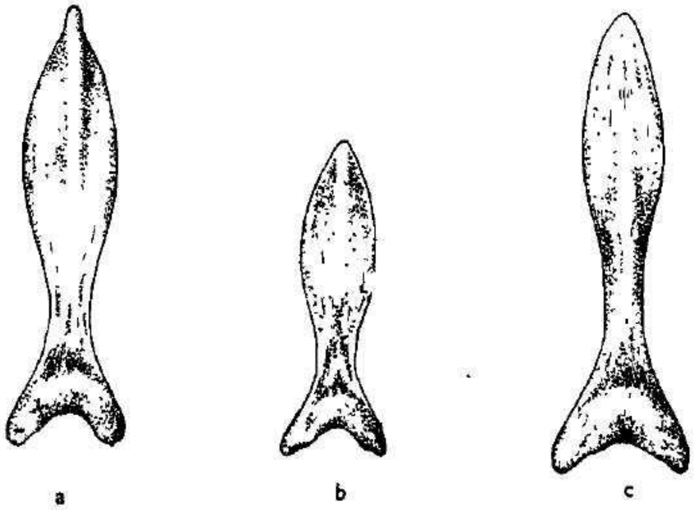
Grösse der meisten Schädelmasse zwischen der kleineren Form *R. c. brachygnathus* und der grösseren *R. c. clivosus*, scheint aber näher zu *R. c. clivosus*. In den relativen Massen zeigt sich aber eher die Verwandschaft der beiden Formen von *R. clivosus* gegenüber der selbständigeren Stellung von *R. bocharicus*.

Zahnmerkmale: Das Gebiss von *R. bocharicus* ist durch die starke Reduktion oder auch durch das Fehlen von P^1 und P_2 charakterisiert, was im Ganzen auch dem Stand von *R. clivosus* entspricht. Ein typisches Beispiel dieser Reduktion ist in der Abb. 7 dargestellt; P^1 ist aus der zusammenhängenden Zahnreihe beiderseitig abgedrängt und wenig entwickelt, in einigen Fällen kann der Zahn auch Fehlen (von unseren 23 Stücken nur in einem Falle). C und P^3 berühren sich jedesmal knapp am Rande von Kronen. Im Unterkiefer fehlt in der Regel gänzlich P_2 (von unseren 23 Stück ist in zwei Fällen ein geringfügiges Zähnchen auf der linken Seite, in einem Falle auf der rechten Seite entwickelt). Eine ähnliche Reduktion kennzeichnet auch das Gebiss von *R. clivosus*; wo bei *R. c. brachygnathus* das vollständige Fehlen von beiden P^1 zur Regel wird.



7. Mandibulare (oben) und maxillare (unten) Zahnreihe von *Rhinolophus bocharicus* (No. BB-4).

Baculum: In der Abb. 8 sind die Bacula der drei verglichenen Arten dargestellt; links von *R. bocharicus*, in der Mitte von *R. clivosus* und rechts von *R. ferrumequinum*. Die Gestalt des Baculums aller drei Arten entspricht zwar dem charakteristischen Typ für *R. ferrumequinum*, man kann aber auch deutliche Unterschiede in der Form und besonders in der Grösse erkennen. Das Baculum von *R. bocharicus* entspricht in der Form eher dem Baculum von *R. clivosus*, es ist fast der gesamten Länge nach verhältnismässig breit, ist jedoch durch die auffalend schmälere Spitze charakterisiert. Das Baculum von *R. ferrumequinum* ist im Mittelteil verhältnismässig schmal und wird erst im Endteil breiter. Auffalender sind die Grössenunterschiede; das Baculum von *R. bocharicus* ist verhältnismässig dick und entspricht in der Grösse eher dem Baculum von *R. ferrumequinum*, wogegen das Baculum von *R. c. brachygnathus* wesentlich kleiner ist. Die festgestellten Unterschiede in Form und Grösse der Bacula sind also zur Unterscheidung der drei Formen geeignet und sind auch für die Untersuchung der verwandschaftlichen Beziehungen von Bedeutung.



8. **Bacula** von *Rhinolophus bocharicus* (a), *Rhinolophus clivosus brachygnathus* (b) und *Rhinolophus ferrumequinum* (c). Dorsalansichten.

DISKUSSION

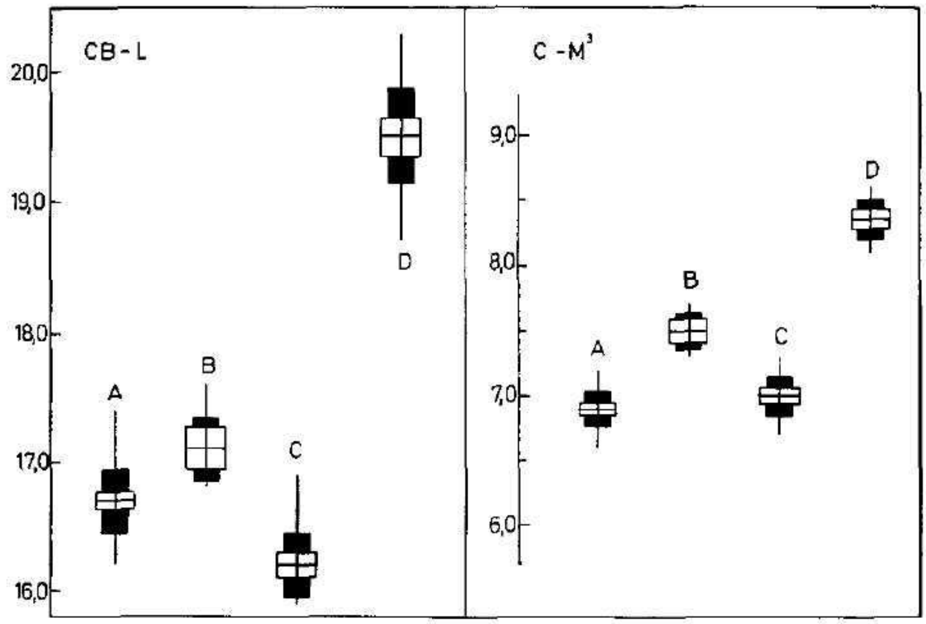
Die Klärung der Frage der systematischen Zugehörigkeit von *R. bocharicus* ist allerdings dadurch erschwert, dass alle drei verglichenen Formen der Gattung *Rhinolophus* in eine Gruppe naheverwandter progressiver Formen gehören. Sie sind durch übereinstimmende morphologische Merkmale charakterisiert, vor allem durch einen stumpfen und abgerundeten oberen Fortsatz der Sella, durch die ziemlich starke hohe Reduktion der zweiten oberen un dritten unteren Praemolaren und durch eine annähernd gleiche Länge des dritten und fünften Metakarpus.

Die Unhaltbarkeit der Anschauung, dass die Form *bocharicus* nur eine Subspezies von *ferrumequinum* sei, lässt sich leicht beweisen. Es wurde erst in letzter Zeit bekannt, dass im gesamten mittelasiatischen Raum neben *R. bocharicus* auch eine licht gefarbte Form von *R. ferrumequinum* vorkommt *(R. ferrumequinum irani ?)*. Die Detailanalyse verschiedener Merkmale hat recht markante Unterschiede zwischen den beiden Arten gezeigt. Andererseits wurde in manchen Merkmalen die Ähnlichkeit zwischen der untersuchten Art und einigen Formen der Art *R. clivosus* Cretschmar, 1828 nachgewiesen. Es ist daher Aufgabe einer systematischen Analyse, vor allem die gegenseitigen Beziehungen der Formen *bocharicus* und *clivosus* zu untersuchen. Zusammenfassend kann man über die Ergebnisse einer solchen Detailanalyse folgendes sagen:

1. Es gibt signifikante Grössenunterschiede zwischen *bocharicus* und *clivosus* (und selbstverständlich auch *ferrumequinum*). Diese Unterschiede

werden an der Condylobasallänge und der Länge der oberen Zahnreihe gezeigt (Abb. 9).

2. An derselben graphischen Darstellung sieht man, dass die Grössenverhältnisse zwischen *bocharicus* und *clivosus brachygnathus* einen ganz verschiedenen Charakter der Condylobasallänge einerseits und der Länge der oberen Zahnreihe andererseits haben. Kurz gesagt, *bocharicus* ist, nach den Werten der Condylobasallänge betrachtet, grösser als *clivosus brachygnathus*, nach den Werten der oberen Zahnreihe ist es umgekehrt.



9. Variabilität der Condylobasallänge (links) und der oberen Zahnreihe bei der verglichenen Formen. A = *Rhinolophus bocharicus*, B = *Rhinolophus clivosus clivosus*, C = *Rhinolophus clivosus brachygnathus*, D = *Rhinolophus ferrumequinum*. Vertikale = Variationsbreite, Horizontale = aritmetisches Mittel, schwarz voll = 1 Standardabweichung beiderseits vom Mittelwert, leeres Rechteck = 2 mittlere Abweichungen beiderseits vom Mittelwert.

3. Diese Proportionsunterschiede kann man ausserdem recht gut an einigen Korrelationsdiagrammen zeigen (Abb. 4, 5, 6). Die demonstrierten Tatsachen zeigen also eindeutig, dass ausser den deutlichen Grössenunterschieden noch ganz klare Proportionsunterschiede im Schädelbau zwischen *bocharicus* und beiden Formen von *clivosus* bestehen.

4. Weitere markante Unterschiede bestehen auch in der Grösse und Form des Baculums. Man kann sie betrachten als massgebend für die qualitative Unterscheidung der drei behandelten Arten.

Sollen auf Grund der festgestellten Tatsachen die obenerwähnten Anschauungen über die systematische Stellung der Form *bocharicus* beurteilt werden, so muss man konstatieren, dass die Analyse, im Einklang mit den Anschauungen Aellens, eine nahe Verwandschaft der Formen *bocharicus* und *clivosus* zeigt. Die festgestellten Unterschiede zwischen diesen beiden

Formen, besonders die Unterschiede im Proportionsplan des Schädelbaues und die in der Form und Grösse des Baculums, weisen aber auch bedeutende qualitative Unterschiede zwischen beiden Formen hin, die offensichtlich während einer langen Zeitspanne der geographischen Isolation entstanden sind. Diese Feststellungen berechtigen uns mehr dazu, beide Formen als zwei selbständige Arten, *Rhinolophus bocharicus* und *Rhinolophus clivosus* anzusehen. Es handelt sich aber offensichtlich um sehr nahestehenden Geschwisterarten.

Die festgestellten Tatsachen werfen auch ein neues Licht auf die vorausgesetzte phylogenetische Entwicklung der Formengruppe von *ferrumequinum, bocharicus* und *clivosus.* Wenn man die Anschauung Andersen's (1905) annimmt, dass es sich um eine Gruppe von Formen indomalaischer Herkunft handelt, deren nächster Vorfahre in der südasiatischen Art *Rhinolophus affinis* zu suchen ist. Die weitere Entwicklung der erwähnten spezialisierten Formen der gemässigten Zone verlief offensichtlich in zwei Ästen. Der eine führte offenbar zur Bildung der zahlreichen Formen der Art *R. ferrumequinum,* der andere dann zur Bildung der Formen *bocharicus* in Mittelasien, *R. clivosus clivosus* auf der Arabischen Halbinsel, *R. clivosus brachygnathus* in Nordafrika und wahrscheinlich zur Bildung einiger südafrikanischer Formen, die heuzutage unter die Art *R. augur* zusammengefasst werden. Die paläarktischen Arten *bocharicus* und *clivosus* sind vor allem durch eine Verminderung der Körperdimensionen und durch einige weitere progressive Merkmale, zum Beispiel durch die fortschreitende Reduktion der Praemolaren gekennzeichnet. Nach diesen Merkmalen scheint *R. clivosus brachygnathus* die am meisten progressive Form zu sein, da bei ihr die betreffenden Praemolaren gänzlich verschwunden sind und dadurch auch die Brachycephalie entstand. *Rhinolophus bocharicus* kann daher als ein ursprünglicherer Typ betrachtet werden, der sich offensichtlich in den speziellen Verhältnissen des isolierten mittelasiatischen Gebietes in einer abweichenden Weise entwickelt hatte und der arabischen Form *R. c. clivosus* am nächsten steht.

ZUSAMMENFASSUNG

Die vorgenommene Analyse der Körper- und Schädelmerkmale von *R. bocharicus, R. clivosus clivosus, R. clivosus brachygnathus* und *R. ferrumequinum* ssp. hat im Einklang mit Aellen (1959) die nahe Verwandschaft von *R. bocharicus* und *R. clivosus* bewiesen. Andererseits wurden jedoch einige Unterschiede festgestellt, vor allem in relativen Schadelmassen und in der Morphologie des Baculums, die uns gemeinsam mit den zoogeographischen Standpunkten berechtigen, die mittelasiatische Form als eine selbständige Art zu betrachten.

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THE FIRST FOUND OF NATURAL STURGEON HYBRID ACIPENSER RUTHENUS LINNAEUS, 1758 x ACIPENSER GÜLDENSTÄDTI COLCHICUS MARTI, 1940 IN THE DANUBE

KAROL HENSEL

Received September 30, 1968

Through the courtessy of Mr. Valent Vincze from the State Fishery Staff in Štúrovo (Southern Slovakia) I have received one specimen of the sturgeon, which was captured in March 1968 in the river Danube near the village Radvaň nad Dunajom (about 18°22′ EL, 47°44′ 18″ NL) during the low level of the river. The specimen was seined by haul net of 130 m in length and 3,60 m of depth, meshes 35 × 35 mm. The specimen was determined as a hybride between *Acipenser ruthenus* and *Acipenser güldenstädti colchicus* and I am enclosing its description.

Total length 324 mm, D 37, A 29, dorsal scutes 11, lateral scutes 38, ventral scutes 9, number of branchial spines 18. The plastic features are given in the table. The rostrum of this sturgeon is bent upstairs. Barbels are not fringed and relatively long, but do not reach up to the upper lip. The upper part of the body below the dorsal scutes is covered by distinctly visible small shields, the rest of the body surface is covered by small denticles. From the russian sturgeon *Acipenser güldenstädti* the hybrid above all differs by the relatively long rostrum bent upstairs and by the length of the barbels, from the sterlet *Acipenser ruthenus* by the different number of scutes in general and by lacking of the fringed barbels. For other differences see the table.

Nikoljukin (1952) received the artificial hybrids of *Acipenser güldenstädti* × *Acipenser ruthenus* and *Acipenser ruthenus* × *Acipenser güldenstädti* from parental specimens captured in the river Wolga. Comparing my specimen with the description of these hybrids and the figures in Berg (1948) I suppose my determination is right. It is an interesting fact the occurence of such hybrid in the Roumanian part of the Danube is not mentioned by **Bănărescu** (1964).

		Danube	Wolga (Nikoljukin, 1952)			
		A. ruth. × *A. güld.*	*A. guld.*	*A. güld.* × *A. ruth.*	*A. ruth.* × *A. guld.*	*A ruth.*
	total length in mm	324	176 149–219	169 141–192	148 119–175	160 180–202
	rays in dorsal	37	41.3 36–49	42.9 37–49	41.6 36–47	43.6 38–49
	rays in anal	29	26.3 22–33	26.7 23–33	24.7 22–31	24.3 20–30
	dorsal scutes	11	15.4 10–19	15.1 12–18	12.5 9–15	14,0 12–16
	lateral scutes	38	42.2 33–51	48.3 37–55	42.3 34–51	61.5 52–71
	ventral scutes	9	10.3 7–12	12.1 10–15	10.5 8–13	14.1 11–17
	branchial spines	18	22.3 18–28	20.4 16–24	16.3 13–21	17.2 14–21
in % of body length	head length	21,2	20.6 19.4–22.9	21.7 20.1–23.7	23,0 21.1–24.6	23.1 21.8–24.8
	predorsal distance	58.2	—	—	—	—
	proventral distance	50.0	—	—	—	—
	preanal distance	62.2	—	—	—	—
	maximum body depth	11.5	—	—	—	—
	minimum body depth	3.1	—	—	—	—
	length of caudal peduncule	11.1	—	—	—	—
	distance P—V	30.7	—	—	—	—
	distance V—A	11.4	—	—	—	—
in % of head length	preorbital distance	47.5	42.8 40.1–44.9	43.9 39.9–46.1	44,8 40.2–47.6	45.9 40.2–49.9
	eye diameter	9.2	—	—	—	—
	postorbital distance	43.7	45.5 40.1–49.2	44.2 40.6–47.7	43,8 40.3–47.8	42.8 39.9–46.3
	head width	41.4	43.4 39.8–46.9	41.7 38.8–45.6	39.9 35.7–44.8	34.3 29.8–37.8
	interorbital distance	34,0	—	—	—	—
	barbels' length	20.1–23.6	18.0 15.2–21.7	20.1 17.9–22.9	21.6 19.2–23.7	22.3 20.2–24.9
	mouth width	27.0	28.7 26.7–30.9	26.1 23.8–28.5	25.2 23.3–28.3	19.7 17.1–22.3

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The plates will be found at the end of this issue.

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IRREGULARITIES IN THE FORMATION OF THE MANDIBULAR JOINT IN EIRA BARBARA (LINNAEUS, 1758) (MAMMALIA: MUSTELIDAE)

IVAN HERÁŇ

Received Jannuary 17, 1969

Abstract: Anomalies in the formation of processus articularis (=condyloideus) mandibulae and of fossa mandibularis in four specimens of *Eira barbara* (L.) are described. The causes that may account for these malformations are discussed.

Examining the osteological material of Mustelidae in collections of the Zoological Museum of Humboldt University, Berlin, the author has found unusual irregularities in the formation of the mandibular joint of Tayras, *Eira barbara* (Linnaeus, 1758). Deformations of various intensity were found in four specimens of the total number of 45 Tayra-skulls examined. That is a relative high percentage of the occurrence in this species. All the skulls have belonged to adult middle-sized specimens; in two of them only left mandibular joint was sustained while in the two others both left and right joints were malformed. Three kinds of these malformations can be distinguished:

i) Skull no. 23104 (female, condylobasal length 110.0 mm). Right mandibular joint normal. The left processus articularis mandibulae essentially similar in shape to the right one. The joint surface reduced to three quarters of the total width of capitulum, the lateral quarter of which is tap-like formed (Fig. 1). Left fossa mandibularis reduced in size, with proportions corresponding to the respective processus articularis (Fig. 3).

ii) Skull no. 14218 (male, condylobasal length 110.8 mm). Right mandibular joint normal. Processus articularis mandibulae on the left side throtted in its medial third with bulging lateral part (Fig. 2). The joint surface continuous. The left fossa mandibularis exhibiting two concave indents corresponding in size and shape to the formation of the respective processus articularis (Fig. 4).

iii) Skull no. 23103 (female, condylobasal length 110.1 mm). Both the left and right processus articulares distorted with elongated lateral parts and with small separated joint surfaces in their medial parts (Fig. 5, 6). Fossae mandibulares separated each into the two joint surfaces corresponding in their form to the shape and proportions of the respective processus articulares.

Skull no. An 23110 (female, condylobasal length 117.1 mm). Both left and right processus articulares elongated, distorted and crook-like curved on their medial sides (Fig. 7). Lateral part of both of them formed by short convex joint surface; their crooked medial parts bearing small concave joint surfaces. Fossae mandibulares analogous in shape to the opposite processus articulares with proportions corresponding to the formation of the latter.

The length of processus articulares measured transversally as the direct distance between the extremes of capitulum mandibulae is larger in the joints deformed than in those of the normally built skulls; in the skull no. 14218 this length is greater in the left anomal capitulum than in the right normally shaped one. Only in the skull no. 23104 where the normal processus articularis is bigger, these relations are reversed. On the whole the deformation mentioned sub (ii) is probably similar to those listed sub (iii) while in the first case (i) the kind of the anomaly seems to be somewhat different.

The mandibular joint in Tayras as well as in other Mustelidae is characterized as articulus ginglymus, strictly specialized for unilateral jaws movements only. Gaupp, 1911, even stated that this joint is in Mustelidae the most extremely monofunctional of all the mammals. In Tayras, the jaw movements (that means mandible depression and elevation) can reach the extent of about 80° – 90°, measured on the prepared skulls; in general, this extent is maintained in all the specimens referred to and is not even reduced by the extensive deformations of processus articulares in the skull no. An 23110 (Fig. 8). That means that the function of the mandible has been in principle maintained in all the skulls described.

As far as the mandibular joint is concerned the manual of pathological anatomy of domestic animals (Nieberle & Cohrs, 1954) contains a short paragraph about inborn ankylosis only. Cases like those described in the present study are, however, not given account of. According to Weber (1928) the teeth structure and position as well as the character of diet are the main factors influencing the formation of the mandibular joint. In these points, however, no divergences were found between the four specimens described here and other skull-materials of Tayras. Neither assymetry of skulls nor that of their parts, resulting regularly from a changed state in the skull musculature (comp. Anthony, 1903; Washburn, 1947 etc.), have been found in these specimens in spite of the fact that it is usually mentioned in papers dealing with similar cases (Toldt, 1904; Heráň, 1965). No traces of injuries were found that might appear as the secondary causes of these deformations. Therefore a developmental defect, not directly influenced by external stimulation, seems to be the most probable cause of the described irregular formations of the mandibular joint in Tayras.

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DISCOVERY OF THE CHINESE GRASS CARP — CTENOPHARYNGODON IDELLA (VALENCIENNES, 1844) IN THE MORAVA RIVER, CZECHOSLOVAKIA

JURAJ HOLČÍK

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Abstract: The author describes a discovery of the Chinese grass carp — *Ctenopharyngodon idella* in the Morava (March) river between Marchegg and Devínska Nová Ves. It concerns the juvenile male measuring 498.7 mm, weighing 2265 grams the age of it was 3+. Calculated lengths were l_1 131 mm, l_2 300 mm and l_3 467 mm. The fish has probably the same origin as two *other previously described by* Balon (1968) *in the Danube river — it originates from the second* Hungarian import in 1964.

By the courtesy of Mr. Peter Kronauer, chief of the State Fishery group in Devínska Nová Ves, the Slovak National Museum in Bratislava received a catch of the Chinese grass carp — *Ctenopharyngodon idella* (Valenciennes, 1844). This is the second published record of this species in Czechoslovakia, and the first one from the Morava (March) river (see Balon, 1968). The fish was caught in the Morava river between Marchegg (Austria) and Devínska Nová Ves (Czechoslovakia) by means of the haul seine, at night September 10th, 1968. The fish is a juvenile male measuring 498,7 mm (standard length) and weighing 2265 grams (Fig. 1). Its age according to scales is 3+ (Fig. 2).

The fish was still alive when brought to the museum. It had been damaged at the upper lip (both praemaxillaria bones were visible), due to its violent movements in storage box. The back and upper part of head sides were bluish-brown. Pectoral and ventral fins were pale, other fins were greyish-blue, belly was yellowish-white.

The counts and measurements of this specimens are as follows: D III 7, A III 7, l.l. $38 + 1\,^{7}/_{6}$, gill rakers 16 (outside of the first branchial arch), pharyngeal teeth 2.4—4.2, their grinding surface deeply plicated. Total length 573.5 mm, standard length 498.7 mm.

In % of the standard length:

head length (without the gill cover border)	22.4	caudal peduncle length	17.6
praeorbital distance	8.2	caudal peduncle depth	12.6
internasal distance	6.4	minimal body depth	11.7
diameter of eye	2.7	P—V distance	30.0
distance between eyes	12.4	V—A distance	26.0
postorbital distance	12.0	length of D	10.0

head height	16.4	length of A	9.1
head width	15.7	length of C_1	14.3
praedorsal distance	49.7	length of C_2	15.7
praeventral distance	51.5	length of P	16.4
praeanal distance	76.2	length of V	13.8
body depth	22.9	depth of D	15.6
body width	17.7	depth of A	12.8

All counts and measurements agree well with those from literature (Berg, 1949; Wu, 1964) and with those found by Balon (1968) in fishes caught in the Danube river. The only exception is the number of ramified rays in anal fin which is lower (7 only) than that recorded in the literature (8).

The origin of our fish is certainly the same as those described by Balon (l.c.) — it originates from the second Hungarian import in 1964, the part of which has descended the Danube river during the huge flood in summer of 1965. The above mentioned Hungarian import of grass carp in 1964 was distributed among three fishery pond stations: Paks, Gödöllö and Szarvas (Sedlár and Geczö, 1967 — see Fig. 3). It is most probable that our specimen came from the ponds of Paks laying directly on the Danube river. In every case the distance between the point of probable release and the place of capture is remarkable and measures about 200—350 km in the upstream direction. Up to this time we do not know if also in the middle and lower section of the Danube river or its larger tributaries this species was caught.

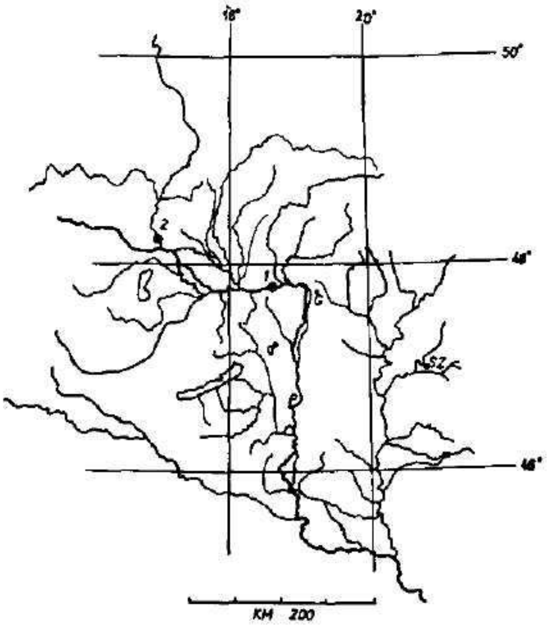

Fig. 3: Map showing the part of the Danube river and its chief tributaries, and the localities of capture of the grass carp together with the fishery pond stations in Hungary where it was imported. P — Paks, G — Gödöllö, SZ — Szarvas, 1 — locality of the first record (Balon, 1968), 2 — locality of the second record.

The growth of this fish is excellent. In the first year of life it reached 131 mm,*) in the second 300 and in the third 467 mm, and is better than the growth of the fishes described by Balon (l.c.). It seems that this species adapted well to the conditions existing in our rivers including the great pollution of the Morava river. According to Mr. Kronauer, his group of fishermen had caught this species in the Morava river several times. It will be interesting to find if the natural reproduction sets, which can be expected in 1969—1970. The sexual maturation of this species sets in, as known, in 5th or 6th year of its life.

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*) Growth was calculated by the means of R. Lee method using 15 mm correction value.

LITERATURE

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The plates will be found at the end of this issue

Note

When this article was already in print I have received the information on planting grass-carp by Hungarians into the Danube river. This introduction is realised several years (Mr. Leonard **Volček**, officer of Ministry of Agriculture of the Slovak Socialistic Republic - personal communication). May be, therefore, that all specimens of the grass-carp found in the middle course of the Danube river originate from this introduction and only a small part from the fortuitous descendind of the Danube river during the flood in 1965.

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THE MYODOME IN SOME TELEOSTS

OTA OLIVA & VLASTISLAV SKOŘEPA

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Abstract: In 7 teleosts, namely *Ctenopharyngodon idella, Hypophthalmichthys molitrix, Ophiocephalus argus, Trigla lucerna, Uranoscopus scaber, Trichiurus lepturus* and *Scorpaena porcus* eye muscle topography and myodomes were studied and their detailed description is presented. In two Cyprinids, *Ctenopharyngodon, Hypophthalmichthys* and then in *Trichiurus* and *Trigla* both myodomes, especially posterior ones, are well developed. *Ophiocephalus* possesses comparatively short myodomes, in *Uranoscopus* myodomes are lacking In *Scorpaena* there is a short anterior, but a long posterior myodome.

INTRODUCTION

The definition of myodomes and their classification together with the whole complex problem of these structures was presented in our previous communications (e g. Oliva, 1961; Oliva & Skořepa, 1968a, b, c; Oliva, Skořepa & Stokłosowa, 1968).

The whole problem of the myodome was studied by several authors from the pure anatomical point of view (Allis, 1919, 1928; Goodrich, 1909, 1930; De Beer, 1937; Gregory, 1933, 1951; Edgeworth, 1935; Holmgren, 1943; Holmgren and Stensio, 1936; Piveteau, 1954) or with regard to the use of this structure in the classification of fish taxons (e g. Jordan et Evermann, 1898; Svetovidov, 1952; Berg, 1955, Barsukov, 1959), but in its complexity the whole problem is still open. This is caused by the curious conservative tendencies in phylogeny of the oculomotor apparatus on one hand, and on the other hand, by the almost unknown influences of "ecological conditions" in the broad sense on this apparatus, as has been shown, e g. by the present authors (Oliva and Skořepa, 1968a, b, c) in Cyprinids.

In the present paper, we wish to add further support in favour of a rather negative influence of the environment and phylogenetic status on the size and developmental stage of myodomes. We have chosen one algivorous cyprinid *(Hypophthalmichthys molitrix)*, one herbivorous cyprinid *(Ctenopharyngodon idella)*, one carnivorous "labyrinthine" species (*Ophiocephalus argus*, order Ophiocephalida), and 4 species of perciform fishes, one pelagic species (Trichiurus), 3 benthonic, *Trigla lucerna, Uranoscopus scaber* and *Scorpaena porcus.*

MATERIAL AND METHODS

The amputated fish heads were fixed in formalin (4%), then transfered into 5% trichloracetic acid, finally deposited in 80% alcohol, as described in our previous communications (e.g. Oliva & Skořepa, 1968). The length of eye muscles was measured on separated eye muscles by means of dividers with ± 0,1 mm accuracy (Oliva, 1964, Oliva & Stokłosowa, 1966). In the course of preparations, photos of the position of eye muscles were made, as in previous communications (e.g. Oliva, 1967); all drawings are based on these photos. The diameter of the eye bulb is the greatest longitudinal diameter of the whole bulb after removing it from the orbit. The length of eye muscles is their greatest length. To make possible the comparison of length of muscles in all species the eye diameter was considered to be 100% in every examined species, the length of every eye muscle being given in % of eye diameter.

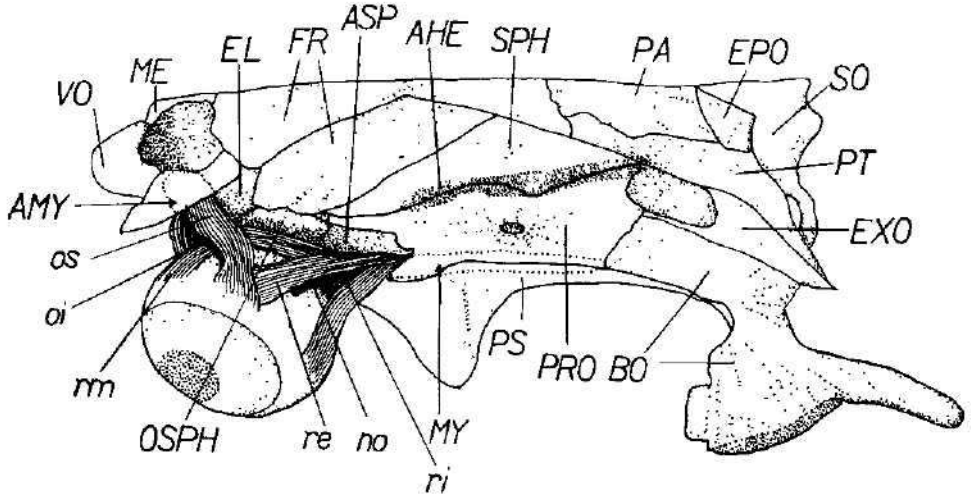

Fig. 1. The lateral view of the cranium of *Hypophthalmichthys molitrix*. See the topography of the eye muscles and the course of both myodomes.

Explanations to abbreviations

AMY — anterior myodome
ASPH — alisphenoid
BO — basioccipital
EL — lateral ethmoid
EXO — exoccipital
EPO — epiotic
FR — frontal
MY — posterior myodome
no — optic nerve
oi — obliquus inferior muscle
os — obliquus superior muscle
PA — parietal

PRO — prootic
PS — parasphenoid
PTM — posttemporal
rm — rectus medialis muscle
re — rectus externus muscle
ri — rectus inferior muscle
rs — rectus superior muscle
SO — supraoccipital
SPH — sphenotic
SPT — supratemporal
VO — vomer

RESULTS

1. *Ctenopharyngodon idella* (Valenciennes, 1844) (Cyprinida, Cyprinidae).

The anterior myodome is formed by lateral ethmoid, mesethmoid, parasphenoid, ethmoidal cartilage and, partially, by vomer. It is entered by two eye muscles, the obliquus inferior and the obliquus superior. The obliquus inferior muscle originates from the parasphenoid, the shorter branch of it originates from the lateral ethmoid. The muscle is wide, its attachment on the eye bulb only partially covers the attachment of the rectus inferior.

The obliquus superior muscle possesses also two points of the origin, similarly as the obliquus inferior, its attachment to the eye bulb covering the attachment of the rectus superior.

The posterior myodome is formed by the prootic, parasphenoid, basioccipital and alisphenoid, only the rectus externus muscle enters the myodome. This muscle originates from the parasphenoid and partially from the basioccipital, it is lateromedially flattened, and after leaving the myodome it becomes dorsoventrally flattened. The rectus inferior muscle originates from the entrance of the myodome from the alisphenoideum near its suture with the prootic. The attachment on the eye bulb is very flat, covered only partially by the attachment of the obliquus inferior muscle. The muscle becomes very narow towards its origin. In one half of its length it encloses the course of the optic nerve (which is very thick). The rectus medialis muscle is flat, its attachment lies on the eye bulb, it originates from the parasphenoid and passes ventrally from all recti except the rectus externus muscle. The rectus superior muscle originates from the prootic near the entrance of the myodome.

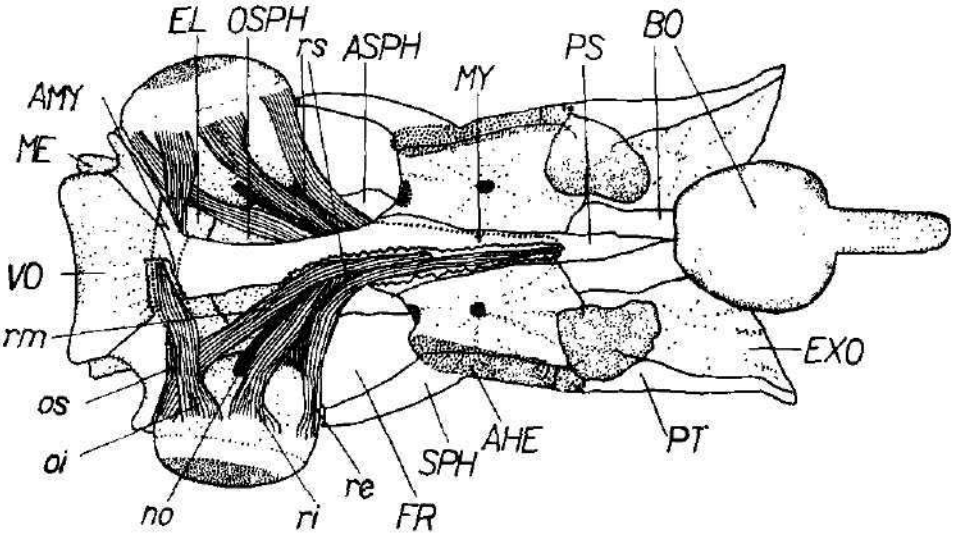

Fig. 2: The ventral view of the same cranium.

2. *Hypophthalmichthys molitrix* (Valenciennes, 1844) (Cyprinida, Cyprinidae).

This species has the anterior myodome, but a relatively shallow one. The canal is surrounded by the ethmoidal cartilage, the lateral ethmoid and from below partially by the vomer. The obliquus inferior muscle is dorsoventrally flattened and becomes narrower in its course from its attachment to the origin. In the myodome both obliqui muscles run in close connection. The obliquus inferior muscle does not cover the attachment of the rectus inferior muscle on the eye bulb, but they are in close contact.

The superior obliquus muscle covers the attachment of the rectus superior on the eye bulb.

The posterior myodome is long and reaches up to the parasphenoid-basioccipital suture. The longest muscle entering it is the rectus externus, which is cylindric in the shape during its course in side the myodome. It posseses two branches; the shorter originates from the first third of the myodomic canal, the second, clearly separated, branch reaches up to the end of the myodomic canal. The rectus medialis muscle originates from the floor of the myodome in the first third of its length from the parasphenoid. This muscle is conical in the shape, runs medially from all recti. It has also two branches, the shorter originates near the entrance into the posterior

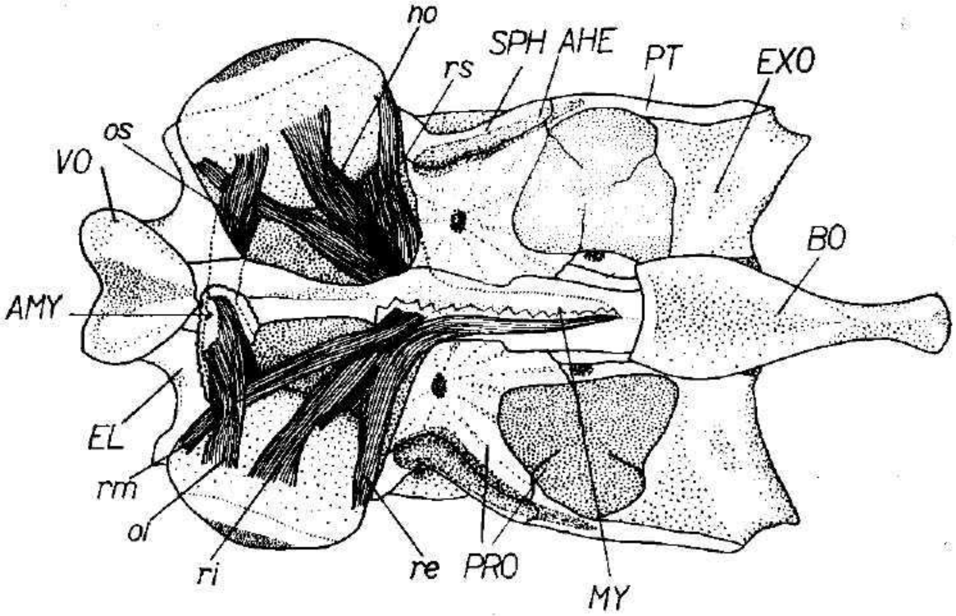

Fig. 3: The ventral view of the cranium of *Ctenopharyngodon idella*.

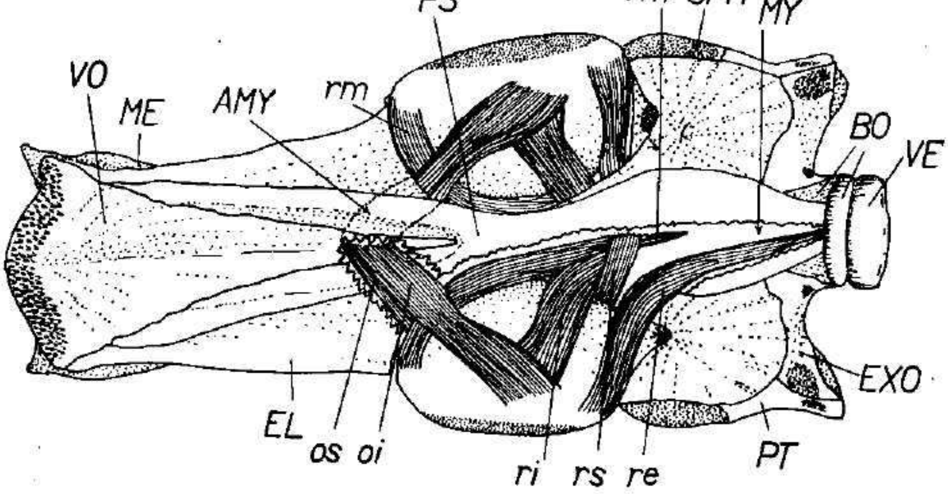

Fig. 4.: The ventral view of the cranium of *Trigla*.

myodome from the parasphenoid; it encloses the origin of the rectus inferior muscle in a shoe-like manner.

The rectus superior muscle originates from the roof of the myodome near its entrance from the prootic closely to the alisphenoid, the second crest-like origin grows from the parasphenoid and runs from the muscle body ventrally, i.e., between the course of the rectus inferior and the rectus externus.

The rectus inferior originates from the parasphenoid near the entrance of the myodome. It is very interesting that the origins of the rectus superior and rectus inferior muscles are thin, the strengthening being ensured by the common fascia enclosing all recti muscles of the left and right eye and forming septs between single muscles.

3. *Ophiocephalus argus warpachowskii* Berg, 1909 (Ophiocephalida, Ophiocephalidae).

The anterior myodome is formed by the obliqui muscles, which are very short and arise on the lateral ethmoid from one point.

The obliquus inferior muscle does not cover the attachment of the rectus inferior. The posterior myodome is formed chiefly by the conical rectus externus, the myodome is not too long and it is formed by the parasphenoid, prootic and alisphenoid. The rectus inferior muscle originates from the prootic, close to the parasphenoid; from the ventral side this muscle covers the course of the optic nerve.

The rectus medialis originates from the parasphenoid ventrally from the other recti muscles. This muscle is flat, also covering the course of the optic nerve from the ventrolateral side. The rectus superior muscle runs ventrally from the rectus inferior, i.e., it originates from the prootic ventrally from other recti close to the parasphenoid.

4. *Trigla lucerna* Linnaeus, 1758 (Percida, Triglidae).

There is an anterior myodome formed chiefly by ethmoidal cartilage, the bordering bones are the lateral ethmoid, the parasphenoid and vomer, which

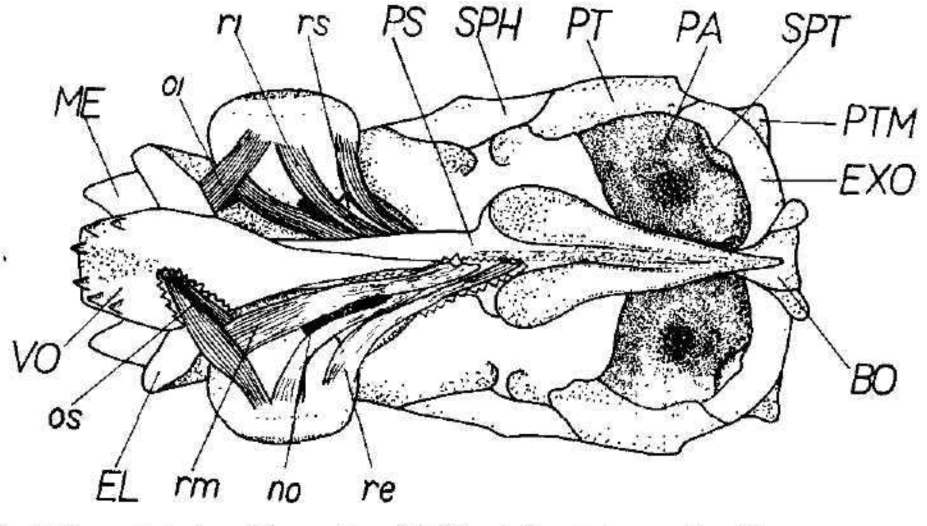

Fig. 5: The ventral view of the cranium of *Ophiocephalus argus warpachowskii.*

covers it from below. Obliquus inferior muscle originates from the parasphenoid; it is dorsoventrally flattened. This muscle is attached to the eye bulb covering simultaneously the attachment of the rectus inferior muscle. The obliquus superior muscle originates from the parasphenoid and in the point of its origin the muscle is in contact with obliquus inferior. This muscle is also dorsoventrally flattened. The attachment does not cover totally the attachment of the rectus superior. The posterior myodome is developed.

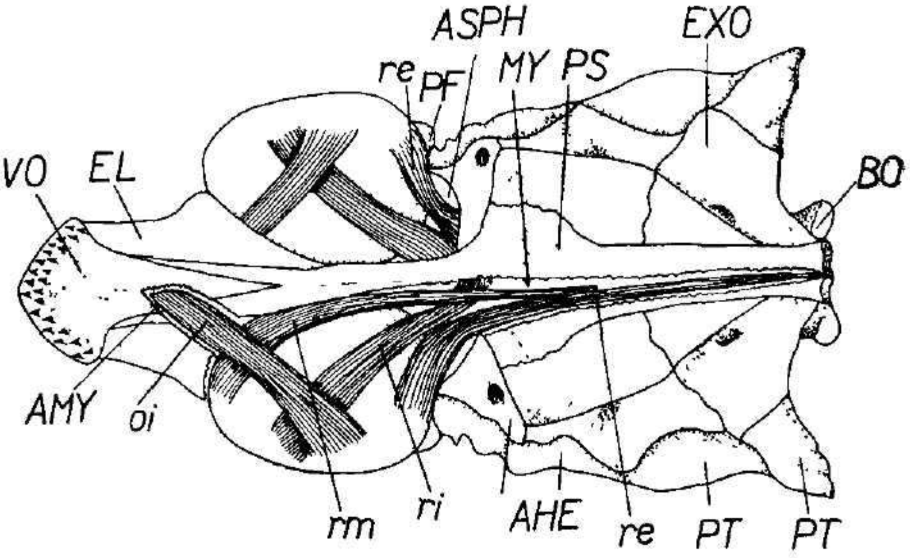

Fig 6 : The ventral view of the cranium of *Scorpaena*

The rectus externus muscle originates from the parasphenoid near the basioccipital and the parasphenoid suture. The muscle runs up to the end of the myodomic canal, in the myodomic cavity it becomes flat. Having entered the myodome, the rectus externus runs laterally of the rectus superior muscle. The rectus inferior runs from the entrance of the myodome from the alisphenoid; laterodorsally from the point of origin of the shorter branch of the rectus medialis muscle. From the origin towards the attachment the muscle is lateromedially flattened, from the begin of the second half of its course (after connecting with the rectus superior) the muscle is flattened dorsoventrally. The rectus superior muscle originates from the parasphenoid; its origin being situated near the course of the rectus externus muscle and medially between rectus inferior and the rectus medialis muscles. In its course, this muscle is flattened from its attachment to the connection with the rectus inferior; from this point to the origin the muscle is conical in shape.

The rectus medialis originates from the parasphenoid in about one half of the posterior myodome length. This muscle has two branches, the shorter one originating from alishpenoid near the entrance of the myodome. This muscle runs ventrally to all recti muscles. In the myodome the medial rectus passes along the superior rectus. The optic nerve runs dorsomedially to all muscles.

5 *Uranoscopus scaber* Linnaeus, 1758 (Percida, Uranoscopidae)

There is no anterior myodome, obliqui muscles arise from the lateral ethmoid on the lateral side

The obliquus inferior is a small muscle covering the attachment of the rectus inferior The origin of the obliquus superior muscle is shifted somewhat dorsoorally as compared with the origin of the rectus inferior; the muscle is flat and very apparently becomes narrow towards its origin. This muscle does not cover the attachment of the rectus superior.

is flat and very apparently becomes narrow towards its origin. This muscle does

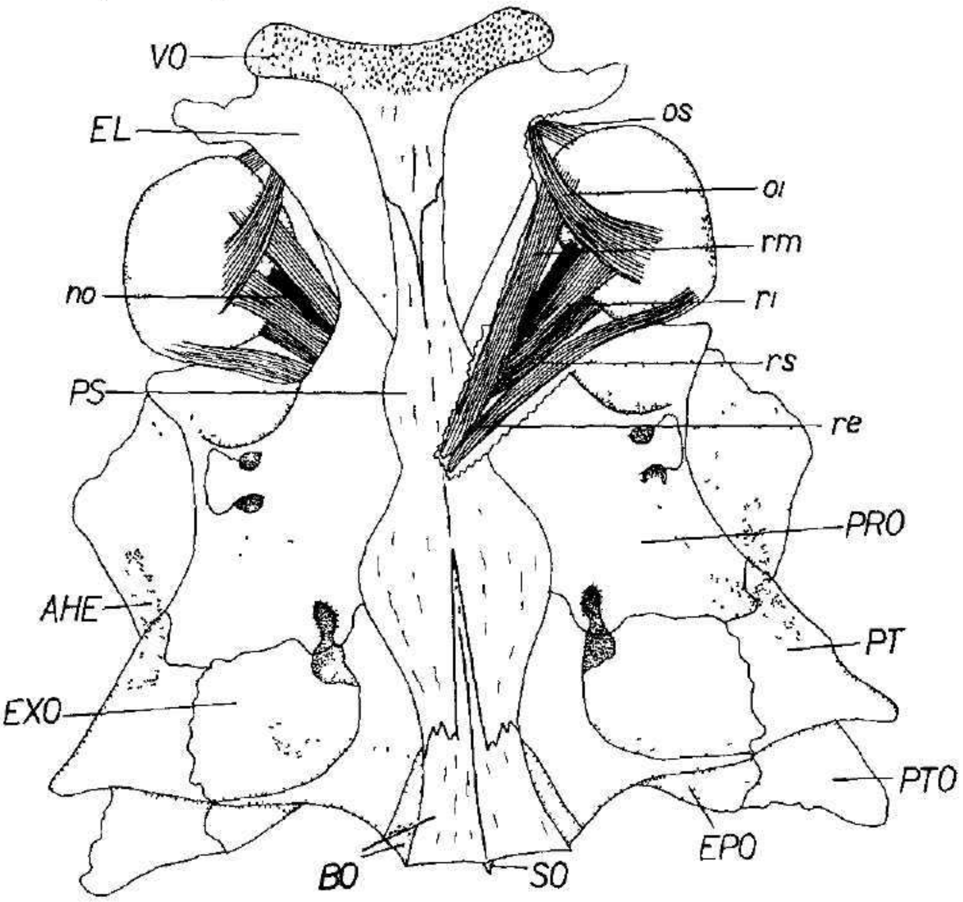

Fig 7: The ventral view of the cranium of *Uranoscopus scaber*

There is also no posterior myodome. All muscles originate from the centre of the parasphenoid, enclosed by common fascia and above the bone. It is possible to speak here only about the "pseudomyodome" represented by the foramen above the parasphenoideum where all recti of opposite eyes meet.

The attachment of the rectus inferior is covered by the attachment of the obliquus inferior, the origin is on the prootic. The rectus externus muscle originates by the broad attachment on the prootic and the alisphenoid. The rectus medialis runs medially to all recti, originates closely orally to the origin of the rectus externus from the prootic and partially the parasphenoid. The rectus superior originates from the parasphenoid above the origin of the rectus medialis, runs laterodorsally to the course of the rectus inferior.

The optic nerve is relatively thick and arises from the eye bulb closely medially to the attachment of the rectus inferior and the obliquus inferior (on the ventral part of the eye bulb).

6. *Trichiurus lepturus* Linnaeus, 1758 (Percida, Trichiuridae).

The anterior myodome exists, it is shallow, formed by the lateral ethmoid, the mesethmoid and frontal, being entered only by the obliquus inferior muscle. The obliquus superior muscle is attached to the eye bulb, twists medial wards it originates from the lateral ethmoid near the entrance into anterior myodome. The muscles are short and they do not penerate into the anterior myodome. As to other interesting features, it should be pointed out, that the eye muscles are very short, both obliqui are almost confluent along their basis, the shortness, of the anterior myodome is caused by the fact that the obliqui run perpendicularly towards the long axis of the head. Their origins are visible in the cartilage. The obliquus superior muscle runs so obliquely downwards that it attaches the parasphenoid. The orbitosphenoid is lacking in its place there is a septum from connective tissue separating, not completly, both eye bulbs.

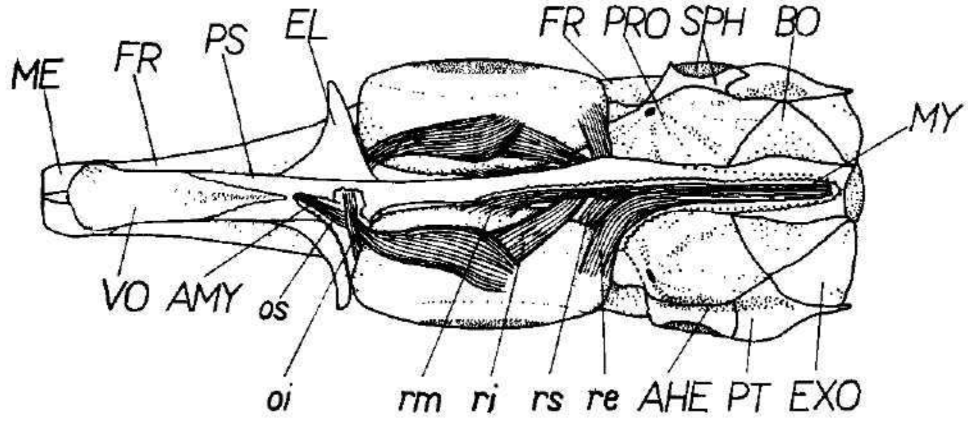

Fig. 8: The ventral view of the cranium of *Trichiurus lepturus*.

The posterior myodome is also present. Its space is entered by the rectus medialis and the rectus externus muscles, both muscles originating from the posterior end of the myodome from the basioccipital and partially from the parasphenoid, at one point. The rectus externus is flat, flattened lateromedially, being the widest at the eye bulb; partially it becomes narrow towards its origin. The rectus superior has its attachment covered by the attachment of the obliquus superior muscle. The former muscle is flat, originating partially from the alisphenoid but chiefly from the parasphenoid

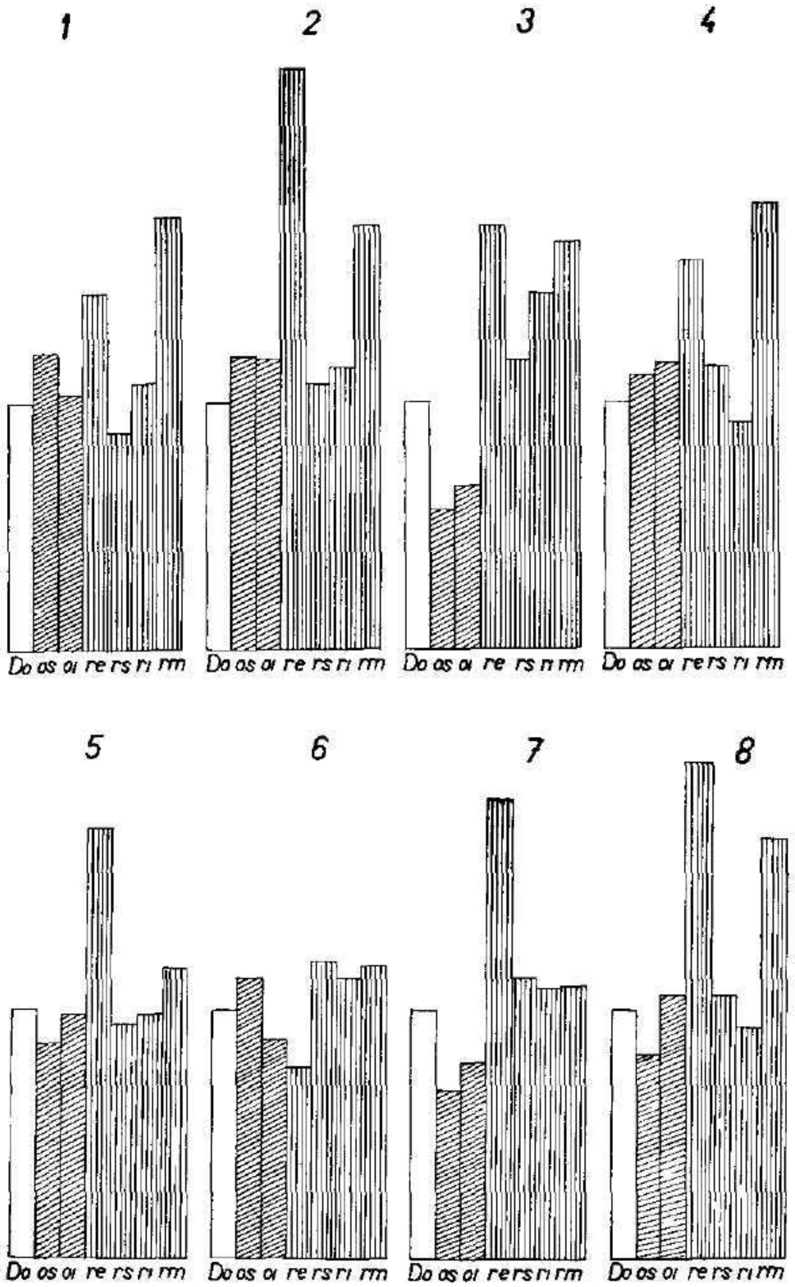

Fig. 9: Relative length of eye muscles in some Teleosts. Do = diameter oculi considered as 100%, the individual length of each muscle being given in % of eye bulb size and illustrated graphically to make possible the comparison. 1) *Coregonus lavaretus maraena*, 2) *Hypophthalmichthys molitrix*, 3) *Uranoscopus scaber*, 4) *Trigla lucerna*, 5) *Ctenopharyngodon idella*, 6) *Trichiurus lepturus*, 7) *Ophiocephalus argus*, 9) *Scorpaena porcus*.

on the entrance of the myodome. It is attached to the aboral part of the eye bulb and runs along the aboral diameter of the eye bulb. Medially to the origin of the rectus superior muscle the rectus inferior muscle has its course. The rectus inferior muscle runs along the medial surface of the bulb and further aboral-lateromedially above the optic nerve. It originates from the alisphenoid near the entrance of the myodome.

The rectus medialis muscle originates from the parasphenoid and the basioccipital together with the rectus externus. The muscle is lateromedially flattened.

7. *Scorpaena porcus* Linnaeus, 1758 (Percida, Scorpaenidae).

The anterior myodome exists, it is shallow, with two obliqui muscles entering it. The obliquus inferior muscle is flat, originating from the lateral ethmoid together with the obliquus superior. The attachment of the obliquus inferior covers the attachment of the rectus inferior. The obliquus superior muscle is dorsoventrally flattened, similarly as the obliquus inferior. The posterior myodome is very long, formed chiefly by the rectus externus; in about one half of the myodome's length penetrates the rectus medialis. The posterior myodome is closed.

The rectus externus is a long muscle, originating from the basioccipital and the parasphenoid sutures; it is conical and towards its attachment to the eye bulb it becomes flat. The rectus medialis muscle is lateromedially flattened. It has two branches, the shorter of which originates from the aslisphenoid, near the entrance of the myodome, the second one from the parasphenoid in about one half of the length of the myodomic canal. Between these two branches there is the rectus inferior, originating from the parasphenoid. The attachment of the rectus superior is not covered by the attachment of the obliquus superior, this muscle originating from the parasphenoid and becoming very apparently conical by shaped towards its origin.

DISCUSSION

From all examined species, *Hypophthalmichthys* possesses the longest rectus externus, which is very curious with regard to the fact, that the fish feeds exclusively on phytoplancton with the exception of the early juvenile period when it feeds on zooplancton (Nie Dashu-Chiang-Shieh-Chih, 1952, Nikolskij, 1956). Also *Scorpaena*, which belongs to another order and lives not pelagially, has long recti muscles, as may be observed in *Ctenopharyngodon*.

Scorpaena porcus lives in shallow water up to 30 m of depth along the shore of the Adriatic between rocks and stones covered with *Cystosira* and *Sargassum* and, sometimes, between "Poseidonia-meadows", and feeds chiefly on Crustaceans; *Scorpaena scrofa*, on the contrary, feeds on fish (Šoljan and Karlovac, 1932).

Scorpaenidae, in general, according to Goode et Bean, 1896 and Jordan et Evermann, 1896, are characterized as "mail checked fishes, having the hypercoracoid and hypocoracoid normally developed, a complete myodome, and post-temporals normally articulated with the cranium". Günther, 1886 wrote that they are lazy fish lying on sand or between the stones covered with algae and waiting for prey, which consists chiefly of small fish.

Ctenopharyngodon idella, a herbivorous species, belonging to Cyprinids, has longer rectus externus than the pelagial *Trichiurus*, which as a zoophagous species.

As to *Trichiurus lepturus*, this fish is according to Goode et Bean, 1896 — a well known species, found in shoal waters from Cape Cod to the West Indies. According to authors this species "enters the estuary of the St. Johns River in Florida, and has been known to leap into rowboats". Linnaeus wrote of it in 1758: "Totus argenteus exilius ex aqua saape in cymbam (Syst. Nat. Ed. X, 1, 246)". This is repeated also by Jordan et Evermann, 1896 together with on the voracity of this species which is also mentioned by Günther, 1886. In general Trichiuridae sometimes descend to great depths (Boulenger, 1904); they have voracious habits (Boulenger, 1904; Day, 1865).

There are also certain similarities between the length of eye muscle apparatus in *Ophiocephalus* and *Scorpaena*] *Scorpaena* differs by longer obliqui muscles and a very long rectus medialis; But in the way of life they have almost nothing in common and both species belong to two different orders. *Ophiocephalus* is a typical carnivorous fish living in swampy rivers and backwaters and using is suprabranchial organ for breathing. In juvenile stage it feeds on zooplankton, but the specimens above 20 cm in length feed only on fish; the victims may be 22—35% of length of snake-head's length (Nikolskij, 1956).

This voracity was observed also by Day, 1865; Beavan, 1877; Boulenger, 1904.

There are no apparent differences in the length of eye muscles between *Coregonus lavaretus maraena* and *Trigla;* they again belong to different orders and also this way of life is fundamentally different.

Gurnards are bottom feeders, the three separate rays of the pectoral fins serving as feelers performing the same function as the barbels in the various members of the cod family (Travis, Jenkins, 1942). There exist about 40 species in 5 genera, some of them living in rather deep waters (these red in color), others around rocks (Jordan et Evermann, 1896). 3 European species were found by French explorers below 100 fathoms, e.g. *Trigla pini* Bloch 1783, in the Gulf of Gascony in 306 meters, *T. lyra* Linnaeus in the same locality in 411 fathoms, *T. cavilonne* Lacépède in various localities from 90—355 meters (Goode et Bean, 1896). According to Le Gall, 1929, *Trigla lineata* (Gmelin, 1778) lives in the Mediterranean and some parts of the Atlantic ocean, mostly on a rocky bottom in the depth ranging from 30 to 50 meters, *Trigla pini* (Bloch, 1783) also in rather deep waters; *Trigla lyra* (Linnaeus, 1758) on the other hand lives in the depths up to 400 meters.*) *Trigla lucerna* Linnaeus, 1758, lives in more shallow waters up to 180 m (Svetovidov, 1936).

As most gurnards lives on sandy bottom, the same as shore fish. Sometimes some gurnards descend to considerable depths up to 1300 meters. It is interesting, that their eggs are pelagic, the larvae are first pelagic and than sink to the bottom and the adult fish are purely benthonic (Svetovidov, 1936).

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*) Faune Ichthyologique de l'Atlantique Nord, publ. sous la dir. M. le Prof. Joubin, Cons. Perm. pour l'expl. de la mer, Copenhague.

With the exception of *Uranoscopus*, in all examined species there is an anterior myodome present, even though shallow in some examples. *Uranoscopus*, which has no anterior myodome, resembles gadids or *Lophius*. The lack of myodome in forms with more platybasic skull can be sompared with *Lophius* or *Uranoscopus*, but not again with *Gadus* or *Lota*.

Uranoscopidae (about 15 species in 4 genera) are carnivorous fish, living on the bottom of the shores of most warm regions (Jordan et Evermann, 1896; Banarescu, 1964). Sometimes they descend to considerable depths (*Uranoscopus crassipes* Alcock in the Bay of Bengal in 98—102 fathoms, see Goode et Bean, 1896).

The long posterior myodome was found in *Hypophthalmichthys*, *Scorpaena*, *Trichiurus*, *Trigla*, *Ctenopharyngodon*, the shorter posterior myodome characterises *Ophiocephalus*, and there is no posterior myodome in *Uranoscopus*] this again resembles the situation in *Lophius*, but in *Gadus* or *Lota* there is also no posterior myodome. If a great interest are spacious and long posterior myodomes in peaceful herbivorous or algivorous *Ctenopharyngodon* and *Hypophthalmichthys* as compared with the same structure in *Ophiocephalus*.

If we focus the discussion of results on two fundamental questions, namely:

1) eyes mobile: long eye muscles and the presence of myodome;

2) eyes immobile; short eye muscles and the lack of the myodome,

we can see, that the theory does not agree with the known facts. E.g., in star-gazer *(Uranoscopus)* the eyes are very small, placed on the anterior and upper portion of the head; and already Günther noted that the eyes "können nach der Wilkür des Fisches erhoben oder niedergedrückt sein" (l.c. p. 327). Since all Percidae posses myodomes (see Allis, 1919), the star gazer is an evident exception, but its mobility of eyes, on the contrary, is quite apparent.

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SUMMARY

All examined species, i.e. *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Ophiocephalus argus*, *Trichiurus lepturus*, *Trigla lucerna*, *Scorpaena porcus*, with the only exception of *Uranoscopus scaber*, possess the anterior myodome. The absence of anterior myodome in *Uranoscopus* resembles the case of *Lophius* or Gadidae. The posterior myodome is long in *Ctenopharyngodon*, *Hypophthalmichthys*, *Trichiurus*, *Scorpaena*, *Trigla*, relatively long in *Ophiocephalus*, but it is lacking in *Uranoscopus*, which again resembles *Lophius*. The presence of well-developed, long and spacious myodomes in *Ctenopharyngodon* and *Hypophthalmichthys*, is very surprising, especially when we compare them with voracious *Ophiocephalus*. This is not in agreement with the theory of the influence of life habits on presence or absence of myodomes.

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THE GUDGEON (GOBIO GOBIO [L.]) FROM THE DUNAJEC RIVER BASIN

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Abstract: The study concerns the biometrics of gudgeon populations from the Dunajec river system in southern Poland. The populations were studied according to age (growth) and environment. Special attention was paid to variability studies. The stabilizing effect of variability in gudgeon was observed.

INTRODUCTION

This work on gudgeon from the Dunajec basin is a continuation of investigations on gudgeon from southern Poland, the previous work by both authors concerned gudgeon from the River Soła (Skóra-Włodek, 1966) and its confluents. The studies on gudgeon were included within the comprehensive plan of ichthyofauna investigations in the rivers of southern Poland. These investigations were initiated by Prof. dr K. Starmach and conducted under his leadership through the Laboratory of Water Biology in Cracow. Here we present a biometrical analysis of gudgeon populations living in the Dunajec river and its confluents.

The Dunajec river, whose sources are in the Tatras, is the second great confluent of the River Vistula. It joins the Vistula to the north of Tarnów at Opatowiec. The basin of the Dunajec comprises the whole eastern part of the Cracow province and a portion of northern Slovakia (Czechoslovakia).

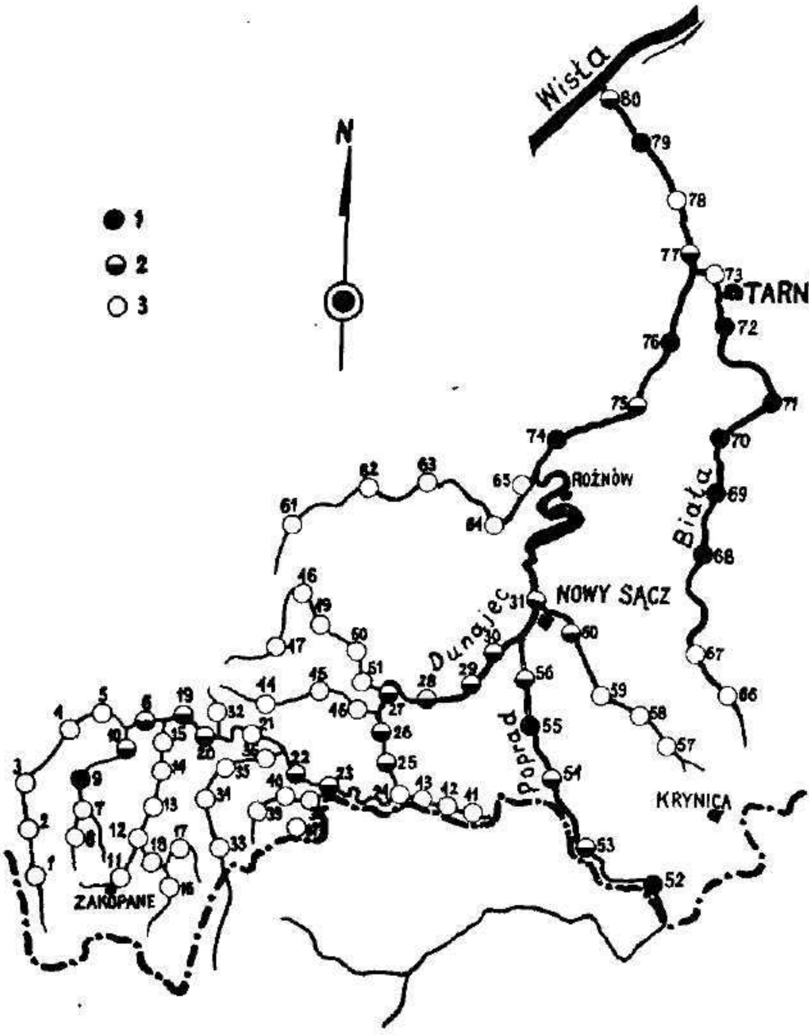
The highest points where gudgeon were found were in the Rogoźnik stream, a right confluent of the Czarny Dunajec, whose geological and hydrologic description was given by Solewski (1963). In our study the highest point where gudgeons were found was in this stream also, at the village Stare Bystre. Solewski (1963) when fishing for graylings found one gudgeon one station higher, at Cichy. It is characteristic that he did not find (1965) any gudgeons in the parallel right confluent of Białka Tatrzanska, which was caused in the authors opinion by different environments.

Kolder (1965) divides the course of the Dunajec into two principal fishing regions the upper region of salmonides which stretches from its sources in the high Tatras to the mouths of the Poprad and the barbel region which stretches from the mouths of the Poprad to the meeting of the Dunajec with the Vistula at Opatowiec. The gudgeon appeared in quantity in the barbel region.

We divided the whole basin in 5 typical habitats: 1) Rogoznik stream, the highest lying stream but not of typical montaneous character, 2) The Upper Dunajec from the mouths of the Poprad at Stary Sącz onward, a typical mountaneous river above Nowy Targ and of intermediary type below Nowy Targ. 3) The river Poprad, of intermediary mountaneous character, 4) The river Biala, a lowland stream with sand and slime on the bottom, it flows through the hilly cultivated land. 5) The lower Dunajec, also a lowland river flowing through agricultural country.

The hydrography of the whole river basin was presented in a work by Ziemońska (1965), its geology in a work by Pasternak (1968), chemistry by Bombówna (1965), and its fisheries productivity by Kolder (1965), hence these problems will not be discussed here. There is a very interesting work on gudgeon from Poland by H. Rolik (1965). Data from this work as well as from the former work by both authors (1966) were used for comparisons with data from the Dunajec system.

The gudgeon from the Dunajec river system is like that from the river Sola, it has an oblong body, a large prolongated head with large eyes and a wedged snout. On each side of the snout there are barbels whose length reaches to mid-eye. Beneath the dorsal part of the body there is a row of large dark patches. The whole bodv, apart from the neck, was covered with scales.



A diagram of the Dunajec river system indicating stations and sectors fished. 1. gudgeon were abundant, 2. single specimens of gudgeon, 3. no gudgeon.

MATERIAL OF GUDGEONS AND METHODS USED

The investigated gudgeon material was caught in comprehensive fishing expeditions organized by the Laboratory of Water Biology in the Dunajec river system in Autumn and Spring 1964.

Table 1. The gudgeon from the Dunajec river system in southern Poland*)

No	Name of river or stream	No of station in the river system	Name of station or sector of river fished	Date fishing	Character of bottom	No of gudgeon caught	No of fishes caught	%% of gudgeon in station to all gudgeon	%% of gudgeon to all fishes in a station
1	Czarny Dunajec	6	Nowy Targ	7. IX. 63	gravel	3	98	1.8	3.1
2	Rogoźnik Wielki	9	Stare Bystre	7. IX. 63	gravel and sand	11	210	6.7	5.2
3	Rogoźnik Wielki	10	Ludźmierz	7. IX. 63	gravel and sand	1	138	0.6	0.7
4	Dunajec	19	Waksmund	7. IX. 63	stones and gravel	2	147	1.2	1.4
5	Dunajec	20	Łopuszna	7. IX. 63	stones and gravel	1	107	0.6	0.9
6	Dunajec	22	Czorsztyn	9. IX. 63	stones	3	36	1.8	8.3
7	Dunajec	23	Nidzica	9. IX. 63	stones	1	83	0.6	1.2
8	Dunajec	25	Krościenko	12. IX. 63	stones	1	97	0.6	1.0
9	Dunajec	26	Tylmanowa	12. IX. 63	boulders	2	124	1.2	1.6
10	Dunajec	27	Zabrzeż	12. IX. 63	stones	1	99	0.6	1.0
11	Dunajec	28	Jazowsko Dolne	13. IX. 63	stones	1	138	0.6	0.7
12	Dunajec	29	Kadcza	13. IX. 63	stones	3	132	1.8	2.3
13	Dunajec	30	Podegrodzie	13. IX. 63	stones	1	90	0.6	1.1
14	Dunajec	31	Nowy Sącz	13. IX. 63	stones	4	194	2.5	2.1
15	Poprad	52	Muszyna Folwark	22. V. 64	stones	5	99	3.1	5.0
16	Poprad	53	Żegiestów	22. V. 64	stones	4	121	2.5	3.3
17	Poprad	54	Piwniczna	22. V. 64	stones and gravel	1	113	0.6	0.9
18	Poprad	55	Rytro	22. V. 64	stones and gravel	5	139	3.1	3.5
19	Poprad	56	Stary Sącz	22. V. 64	stones and gravel	1	125	0.6	0.8
20	Kamienica Nawojowska	60	Zawada near Nowy Sącz	21. V. 64	stones	1	41	0.6	2.4
21	Biała	68	Bobowa	25. V. 64	stones and gravel	16	162	9.8	9.8
22	Biała	69	Ciężkowice	25. V. 64	stones and gravel	8	57	4.9	14.1
23	Biała	70	Gromnik	25. V. 64	gravel and sand	8	261	4.9	3.1
24	Biała	71	Tuchów	25. V. 64	gravel and sand	14	131	8.6	10.6
25	Biała	72	Tarnów	25. V. 64	gravel and sand	26	196	15.9	13.3
26	Dunajec	74	Czchów	21. V. 64	stones and gravel	11	125	6.7	8.8
27	Dunajec	75	Zawada Lanckorońska	21. V. 64	stones and gravel	4	60	2.5	6.7
28	Dunajec	76	Zgłobice	25. V. 64	stones, gravel, sand	9	233	5.5	3.9
29	Dunajec	77	Biała near Tarnów	26. V. 64	stones, gravel, sand	1	89	0.6	1.1
30	Dunajec	79	Otwinów	26. V. 64	gravel and sand	12	124	7.4	9.7
31	Dunajec	80	Ujście Jezickie	26. V. 64	gravel and sand	2	106	1.2	1.9
						163	3875	100.0	4.2

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*) From Kołder (1965a)

Alltogether 163 gudgeon were caught which made 4.2% of all fishes caught during the expeditions. 82 stations were fished in the whole system of the river Dunajec, but only in 31 stations were the gudgeon found. (Table 1.) All stations fished are shown also on the map (Figure 1.), stations where gudgeon were found being indicated specially. The greatest number of gudgeon relatively and absolutely was found at Bobowa, Tarnów and Tuchów, all three stations lying on the Biała river. In the Dunajec itself the greatest number of gudgeon was found at Otwinów and Czchów, that is in the lower course of the river. It is characteristic that the greatest abundance of gudgeon in the whole river system was found in the river Biała which has a sandy and slimy bottom.

The fishing in the rivers and streams of the Dunajec system was carried out by means of a direct current generator. The fishing was done from a boat floating with a generator and 4 men down a chosen sector of the river. The sectors were chosen systematically along the "navigable" part of the river. If the depth of the sector did not permit boating, the generator was placed on the bank and the fishermen waded in the stream. In the latter situation the sector, or in this case station, was about 200 m long, this being the length of the generator wires. The sector boated averaged 2—3 km. From the whole catch, which was considered as representative for the fish populations in the sector fished, all gudgeon were removed and conserved, (the other species not under study being counted, weighed, and returned to the river. The gudgeon were conserved in 4% formalin and put into polythene bags. The assumption underlying this method of fishing is that the direct current generator stuns fishes at random so that the sample of the sector is representative. The conserved gudgeon were measured at a later date in the Laboratory in Cracow according to the scheme of measurements used at the Laboratory and comprising 35 features. Those same features were investigated in the earlier work of both authors on gudgeon from the Sola river (Skóra-Włodek, 1966).

To the data thus assembled basic statistical analysis was applied, that is means and variability of all 35 features were determined. This analysis was made according to age classes (growth) and to groups of stations. These groups comprised whole rivers or typical parts.

Since the length of the barbels is a very characteristic feature for gudgeon, indices of barbels length were determined, expressed on the basis of pre — eye length and head length. (W_1 and W_2 indices respectively.) Besides in this connection the symmetry of the head was studied. The formulas for these indices were:

$$W_1 = \frac{\text{length of barbels}}{\text{longitudo praeorbitalis}}$$

$$W_2 = \frac{\text{length of barbels}}{\text{longitudo capitis lateralis}}$$

The symmetry was studied according to the formula:

$$P = \frac{\text{longitudo praeorbitalis}}{\text{longitudo postorbitalis}}$$

The numerical values of these indices are shown in Table 2. The indices were calculated on the basis of our material and that from the work of H. Rolik (1965).

35 features were examined on every fish, 34 concerning morphology and one weight. Table 3 shows their relative measurements for body features expressed in relation to the body length and for the head features expressed in relation to the head length; they are presented according to age. As the basis of calculation of percentages is given: the feature of body length and the feature of head length in cm. The weight is also given. No gudgeon older then 5 years were encountered, only one 6 years old female being found.

The following meristic features were measured: 1) number of scales on the lateral line, 2) number of vertebrae, 3) number of patches on the body, 4) number of gill rakers, 5) number of soft rays in the dorsal fin, 6) number of soft rays in the anal fin, 7) number of soft rays in the pectoral fin, 8) number of soft rays in the ventral fin. Besides those features, the length of the intestines was measured and the fecundity of the gudgeon. As the meristic features can be accepted as not changing with time they were used as populations indicators.

The variety of environmental conditions provided for fish in the Dunajec basin gives rise to the question whether or not its influence is so great that there are significant differences between the populations encountered in typical habitats. To answer this question the meristic features were used. The usual statistical method for testing of differences for populations with uneven number of observations was applied (Snedecor, 1959). As there were 5 habitats chosen there were 10 combinations of differences between the habitats to account for.

Table 2. Indices of barbels and symmetry of the head for gudgeon from Poland according to age and fishing station

a) according to age from the Dunajec basin

Age	N	W_1	W_2	P
1+	**14**	65.1	25.3	97.1
2+	**24**	59.8	25.0	37,9
3+	**64**	56.9	23.6	103.8
4+	**39**	56.3	23.3	95.2
5+	**21**	54.2	23.3	100.8

b) according to rivers and streams

River or stream	N	W_1	W_2	P
Rogoźnik 1963	**12**	59.0	25.6	104.3
Upper Dunajec 1963	**20**	60.8	24.1	92.7
Poprad 1963	**16**	53.2	23.4	103.3
Biała 1964	**72**	56.0	23.0	98.2
Lower Dunajec 1964	**39**	57.7	24.4	100.0
Upper San 1960	**21**	54.6	25.3	111.5
Middle San 1956/57	**68**	55.8	25.2	113.5
Tanew 1960	**19**	60.7	27.1	119.5
Wieprz 1929	**20**	61.8	27.5	105.2
Okrzejka 1945	**30**	68.0	32.0	129.4
Wisła near Nieszawa 1959	**15**	55.0	24.3	109.5
Kaczawa, Nysa 1951	**15**	54.3	25.1	109.5
Lake Mamry 1957	**22**	60.3	21.3	100.0

MEASUREMENTS AND THEIR VARIATION

a) The average values of measurements of *Gobio gobio* L. populations

On the average, the gudgeon reached 26 g in weight and 12 cm in body length in the fifth year of growth, i.e. 13.4 in total length. It can be seen from Table 3 that the body proportions of gudgeon are stable, and the growth of the population did not affect this stability e.g., the total length was always 19% greater than the body length, the head length was 1/4 of the body length, the length of the sector between the anus and the neighbouring fins also being stable and amounting to 14.6% to the ventral fin and 8.2% to the anal fin. From this it may be concluded that the anus in the gudgeon lies nearer the anal fin, this being in accordance with the opinion of H. Rolik (1965) and Albertová and Suchomelová (1953). The length between the pectoral and ventral fin was also stable, i.e. 24.3%, the length between the ventral and anal fin being 22.2%. The body of the gudgeon therefore grew very proportionately. It is characteristic that no sexual differences in the body proportions of adult gudgeon can be observed.

Nikolski (1936, after Albertová and Suchomelová, 1953), drew attention to the fact that he failed to find differences between the sexes

Table 3. Comparison of 35 average dimensions of gudgeon from the Dunajec river system in %%

Age class	1+		2+		3+
Number of investigated gudgeon	14	15	9	24	33
Sex	♂♀	♂	♀	♂♀	♂
Feature*)					
longitudo corporis in cm	6.7	8.9	8.6	8.8	10.3
longitudo totalis	119.5	119.7	119.5	119.5	119.5
longitudo corporis	100.0	100.0	100.0	100.0	100.0
longitudo praeanalis	61.4	60.3	61.3	60.7	62.4
longitudo praeventralis	47.7	47.4	48.0	47.6	47,9
longitudo pedunculi caudae	26.8	25.9	24.1	25.2	27.8
longitudo trunci	76.3	76.5	77.1	76.5	75.6
longitudo capitis lateralis	25.2	25.3	24.7	25.1	25.7
longitudo P	19.4	20.5	19.2	20.0	20.0
longitudo V	15.4	16.3	16.3	16.3	16.2
summa altitudo A	15.6	16.7	16.2	16.5	16.0
longitudo pinnae C superior	21.0	20.1	19.8	20.0	20.5
longitudo pinnae C inferior	*20.5*	*20.0*	*20.1*	*20.0*	*20.7*
longitudo pinnae C media	10.9	11.2	11.0	11.1	10.6
summa altitudo D	21.3	22.1	21.7	22.2	21.0
longitudo basis D	11.2	12.8	12.6	12.8	12.8
distantia praedorsalis	45.5	45.9	45.6	45.8	46.6
distantia postdorsalis	43.8	43.7	43.5	43.6	42.9
spatium inter P et V	24.2	24.1	24.4	24.2	24.2
spatium inter V et A	21.4	22.4	22.5	22.4	22.6
spatium inter anum et pinnam A	8.6	8.1	8.2	8.2	8.3
spatium inter anum et pinnam V	14.4	14.4	15.3	14.8	14.3
longitudo basis A	7.5	8.2	8.0	8.1	7.8
summa altitudo corporis	19.5	20.8	20.7	20.8	20.6
minima altitudo corporis	8.3	8.3	8.2	8.3	8.5
altitudo pedunculi caudae	10.0	10.5	9.7	10.2	10.3
summa latitudo corporis	13.1	12.8	14.0	13.2	13.6
latitudo pedunculi caudae	7.1	6.8	6.8	6.8	6.7
summa longitudo in circuitu	58.2	58.4	59.8	58.9	57.8
longitudo capitis lateralis in cm	1.7	2.2	2.1	2.2	2.6
longitudo spatii postorbitalis	40.1	43.2	41.8	42.7	41.1
longitudo capitis lateralis	100.0	100.0	100.0	100.0	100.0
diameter oculi	24.7	21.9	24.1	22.7	21.8
longitudo spatii praeorbitalis	39.0	42.3	40.8	41.7	41.7
longitudo cirri	25.3	25.1	24.9	25.0	23.4
summa altitudo capitis	57.7	60.2	59.6	60.0	56.2
distantia inter oculos	25.3	26.8	26.4	26.7	25.7
pondus in g	4.3	9.8	10.0	9.7	14.7

*) The capital letters refer to the first letter of a fin

according to age class in 1963 and 1964. Body feature in %% of body length, head feature of head length

3+		4+			5+			6+	Adult gudgeon		
31	64	16	23	39	11	10	21	1	75	74	149
♀	♂♀	♂	♀	♂♀	♂	♀	♂♀	♀	♂	♀	♂♀
10.1	10.2	11.3	11.2	11.3	12.1	12.0	12.1	14.2	10.5	10.6	10.5
119.5	119.5	119.5	119.3	119.3	118.8	119.6	119.2	119.0	119.4	119.4	119.4
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
62.7	62.5	63.2	64.6	64.0	64.1	64.9	64.5	69.8	62.5	63.6	63.1
47.9	48.2	50.0	49.5	49.7	48.5	50.9	49.6	49.7	48.4	49.2	48.8
25.7	26.8	26.6	24.0	25.0	23.4	22.7	23.1	21.1	26.5	24.4	25.5
76.9	76.2	76.6	76.4	76.5	77.3	77.6	76.9	75.3	76.3	76.7	76.5
25.7	25.7	25.1	25.8	25.5	24.6	25.4	25.0	26.6	25.3	25.6	25.5
18.9	19.5	18.8	17.5	18.1	19.4	17.4	18.4	15.5	19.7	18.2	18.9
15.9	16.1	15.7	15.4	15.5	15.9	15.7	15.8	14.8	16.1	15.8	15.9
15.8	15.9	15.9	15.7	15.8	15.7	15.8	15.7	15.5	16.1	15.8	15.9
20.3	20.4	19.8	19.6	19.7	18.9	19.8	19.3	19.0	20.0	19.8	19.9
19.8	20.2	20.1	19.2	19.6	18.7	19.1	18.9	19.7	20.1	19.5	19.8
10.7	10.6	10.2	20.2	10.2	9.7	10.4	10.0	9.1	10.4	10.5	10.5
21.0	21.0	20.6	20.1	20.3	19.3	19.7	19.5	19.0	20.8	20.5	20.7
12.7	12.7	12.6	12.3	12.5	12.7	12.2	12.5	14.1	14.7	12.5	12.6
47.3	46.9	46.6	47.3	47.0	46.8	47.2	47.0	47.2	46.5	47.1	46.8
42.8	42.8	43.4	42.9	43.1	44.4	43.5	44.0	42.2	43.4	43.0	43.2
25.1	24.6	24.2	25.3	24.8	23.5	24.1	23.8	23.2	24.0	24.9	24.5
22.0	22.3	22.7	25.2	22.6	22.7	21.5	22.1	23.9	22.6	22.2	22.4
8.7	8.0	8.3	7.7	8.0	8.1	8.1	8.1	7.0	8.2	7.8	8.0
14.3	14.3	14.2	15.3	14.8	14.4	15.2	14.8	16.2	14.3	14.9	14.6
7.3	7.6	7.5	7.7	7.6	7.8	7.5	7.7	8.4	7.8	7.6	7.7
21.3	20.9	21.0	21.3	23.9	21.1	21.1	21.4	22.5	20.8	21.2	21.0
8.0	8.3	8.5	8.2	8.3	8.6	8.6	8.6	9.3	8.5	8.2	8.4
10.0	10.2	10.6	10.4	10.5	11.1	10.5	10.8	9.1	10.5	10.2	10.4
14.5	14.0	13.7	14.7	14.3	14.0	14.9	14.4	17.1	13.5	14.6	14.1
6.6	6.7	7.2	7.0	7.0	7.7	7.7	7.7	7.0	7.0	6.9	7.0
59.5	58.7	58.1	61.9	60.3	60.3	62.1	61.1	62.9	58.4	60.8	59.6
2.6	2.6	2.8	2.9	2.9	3.0	3.1	3.0	3.8	2.7	2.7	2.7
41.2	41.2	43.3	43.4	43.3	42.3	42.5	42.4	41.5	42.2	42.2	42.2
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
22.0	21.9	21.0	20.8	20.9	21.1	19.5	20.3	18.2	21.5	21.4	21.4
41.7	41.7	41.5	41.4	41.4	43.5	41.8	42.7	41.8	42.0	41.6	41.8
24.1	23.7	22.7	23.6	23.2	23.2	23.2	23.3	21.7	23.5	23.8	23.7
57.1	56.6	59.0	57.5	58,1	61.6	58.6	60.1	62.7	58.4	57.8	58.1
26.4	26.0	26.9	27.4	27.2	28.4	27.9	28.1	31.7	26.5	27.0	26.8
14.4	14.4	20.0	20.6	20.4	26.1	26.0	26.0	44.0	16.4	17.3	16.8

in 11 features of gudgeon that he studied from western Siberia and Kazachstan. It is, however, characteristic that in our material and that of Albertová and Suchomelová the anus of the females was nearer the anal fin than in males. Lohniský (1962) is also of the opinion that there are sex differences as to the situation of the anus between the anal and ventral fin. The stability of all body proportions during growth is shown in Tables 4 and 5. Both tables show a striking stability of body proportions, regardless of sex and age. Both tables are conceived as averages of indices. The greatest difference in numbers in Table 4 is only 1.1% and in Table 5 — 1.7%, this shows how stably the proportions grew. The body measurements increase with time but no sex differences were found. The greatest difference in rows in Table 4 was 0.4% and in Table 5 — 0.6%. In many instances the average proportions from Tables 4 and 5 were identical between ages and sexes, so that it can be assumed that there are no differences in the morphology between the sexes and a very stable growth of body proportions.

Table 4. Averages of indices for 27 investigated morphological features of the body of gudgeon from the Dunajec river system in 1963 and 1964 body length = 100%

Age	N	All gudgeon	Males		Females	
			N	♂	N	♀
1+	**14**	28.6	—	—	—	—
2+	**24**	28.6	15	28.9	9	28.8
3+	**64**	28.9	33	28.9	31	28.9
4+	**39**	29.0	16	28.9	23	29.3
5+	**21**	28.9	11	28.8	10	29.7
6+	**1**	29.0	—	—	1	29.0

(averages were calculated on the basis of Table 3)

Table 5. Averages of indices for 6 morphological features of the head of gudgeon from the Dunajec river system in 1963 and 1964 head length = 100%

Age	N	All gudgeon	Males		Females	
			N	♂	N	♀
1+	**14**	35.4	—	—	—	—
2+	**24**	36.5	15	36.6	9	36.3
3+	**64**	35.2	33	35.0	31	35.4
4+	39	35.7	16	35.7	23	35.7
5+	21	36.2	11	36.7	10	35.6
6+	1	36.3	—	—	1	36.3

(averages were calculated on the basis of Table 3)

From Tables 4 and 5 it can be seen that the sex ratio in gudgeon over 2 years old was on the average 1 : 1 which is as might be expected. That which was observed during growth could also be observed according to environment, the stability of morphological features is striking. Table 6 was calculated in the same way as Tables 4 and 5.

From Table 6 it can be seen that the environment did not influence the body and head proportions; the greatest difference was in the first column of this table, 0.6% and of the second column — 1.3%.

Table 2a shows that the barbels of gudgeon do not grow proportionately. Both indices diminish with time, the W_1 index more than the W_2, i.e. the pre-eye length, or, in other words, the length of the snout, grows quicker than the barbels the same being true of the head length. The symmetry did not show any regularity with time, nor can any regularity be observed according to the stream in the relative length of barbels and symmetry, though the gudgeon from the Dunajec system showed more a symmetric head than did those from other parts of Poland. The shortest barbels and the most unsymmetric head was observed in gudgeon from the Okrzejka stream in central Poland (District of Garwolin). Gudgeon from the river Wieprz had short barbels and, the second place in non-symmetry was held by gudgeon from the river Tanew. The longest barbels were found in the Poprad river. The most symmetric head was found in gudgeon from the lower Dunajec and Lake Mamry.

Table 6. Average indices of morphological features for gudgeon populations from typical habitats of the Dunajec river system

River or stream	N	27 morphological features for body. averages of indices, body length = = 100%	6 morphological features of head, averages of indices, head length = = 100%
Rogoźnik 1963	12	28.4	36.3
Upper Dunajec 1963	20	28.7	35.4
Poprad 1963	16	29.0	36.6
Biała 1964	72	29.0	35.3
Lower Dunajec 1964	39	28.9	36.2

b) The variability of *Gobio gobio* (L.) populations

The variability of the investigated features can be expressed in standart deviations (σ) and relatively in the coefficients of variations. Table 7 presents the standard deviations of the material. It can be seen that, with a few exceptions, all variations were under 1 cm. The variations in weight were between 1.4% and 2.6% g. The variations in the population taken as a whole are greater. For age classes the variability is in most cases between 5 and 10%. For those features where it exceeds the 10% level nevertheless it never exceeds 20%. Only for weights in the first year it is 33%. It is characteristic that there were no marked differences between the sexes. When observing changes of coefficients of variation with time, a characteristic decrease and subsequent stabilization of their values on certain levels can be seen. This observation is in conformity with other investigations on variability in freshwater fishes (Włodek, 1966a). The phenomenon was described as the stabilizing effect of variability for carp reared in ponds (Włodek, 1966b). It is linked with that of compensation growth. Włodek (1966a), Zamachajev (1964, 1967) consider compensation growth as a general phenomenon associated with the growth of fish populations.

Table 7. Variability of gudgeon populations in standard deviations (σ)

Age class	1+	2+		
Number of investigated gudgeon	14	15	9	24
Sex	all	♂	♀	♂♀
Feature*)				
longitudo totalis	0.68	1.02	0.61	0.89
longitudo corporis	0.60	0.54	0.53	0.54
longitudo praenalis	0.38	0.31	0.40	0.34
longitudo praeventralis	0.38	0.29	0.45	0.28
longitudo pedunculi caudae	0.24	0.40	0.26	0.36
longitudo trunci	0.53	0.41	0.53	0.62
longitudo P	0.14	0.13	0,07	0.14
longitudo V	0.12	0.12	0.10	0.11
summa altitudo A	0.09	0.12	0.10	0.12
longitudo pinnae C superior	0.14	0.11	0.16	0.13
longitudo pinnae C inferior	0.13	0.12	0.13	0.12
longitudo pinnae C media	0.10	0.08	0.08	0.08
summa altitudo D	0.14	0.14	0.14	0.15
longitudo basis D	0.10	0.12	0.12	0.12
distantia praedorsalis	0.27	0.34	0.22	0.30
distancia postdorsalis	0.31	0.28	0.23	0.27
spatium inter P et V	0.24	0.16	0.14	0.15
spatium inter V et A	0.25	0.16	0.20	0.17
spatium inter anum et pinnam V	0.12	0.09	0.08	0.09
spatium inter anum et pinnam A	0.05	0.09	0.12	0.10
longitudo basis A	0.08	0.08	0.11	0.09
summa altitudo corporis	0.24	0.16	0.15	0.15
minima altitudo corporis	0.06	0.07	0.07	0.07
altitudo pedunculi caudae	0.11	0.07	0.06	0.08
summa latitudo corporis	0.14	0.12	0.14	0.14
latitudo pedunculi caudae	0.11	0.04	0.10	0.07
summa longitudo in circuitu	0.53	0.33	0.50	0.35
longitudo spatii postorbitalis	0.07	0.11	0.12	0.12
longitudo capitis lateralis	0.12	0.18	0.16	0.17
diameter oculi	0.06	0.05	0.04	0.05
longitudo spatii praeorbitalis	0.06	0.09	0.07	0.09
longitudo cirri	0.07	0.07	0.08	0.07
summa altitudo capitis	0.10	0.17	0.07	0.15
distantia inter oculos	0.04	0.07	0.05	0.06
pondus in g	1.44	1.48	1.99	1.66

*) The capital letters refer to the first letter of a fin

It can be seen for gudgeon populations from Table 9. Table 10 shows averages for coefficients of variation for 34 morphological features. From this table it can be seen that the variability drops to a level of ca 7%, on which level it becomes stabilized. No differences between the sexes were found. In head features males showed slightly greater variability than females. The decrease in variability is, however, not so great in morphological features taken as an average of many features. But if a feature is observed individually a substantial decrease of initial variability appears e.g.: in spatium inter P et V (inter pinnam pectoralem and ventralem) from the initial 14.7% to about for 35 investigated features from the Dunajec river system in 1963 and 1964

3+			4+			5+			All adult gudgeon		
33	31	64	16	23	39	11	10	21	75	72	149
♂	♀	♂♀	♂	♀	♂♀	♂	♀	♂♀	♂	♀	♂♀
0.52	0.51	0.52	0.41	0.34	0.37	0.51	0.39	0.45	1.36	1.28	1.32
0.44	0.43	0.44	0.36	0.30	0.32	0.38	0.33	0.35	1.12	1.05	1.09
0.45	0.43	0.44	0.43	0.38	0.39	0.72	0.54	0.63	0.92	0.85	0.89
0.64	0.89	0.75	0.32	0.26	0.26	0.33	0.23	0.31	0.75	0.83	0.79
0.42	0.46	0.47	0.55	0.50	0.53	0.36	0.14	0.28	0.51	0.46	0.58
0.45	0.41	0.46	0.36	0.35	0.35	0.37	0.35	0.36	0.92	0.84	0.88
0.19	0.15	0.19	0.17	0.15	0.17	0.15	0.18	0.21	0.23	0.18	0.22
0.10	0.13	0.12	0.12	0.12	0.12	0.10	0.15	0.12	0.18	0.18	0.18
0.10	0.09	0.10	0.11	0.14	0.13	0.14	0.13	0.13	0.19	0.18	0.18
0.13	0.13	0.13	0.15	0.12	0.13	0.17	0.15	0.16	0.22	0.30	0.26
0.16	0.14	0.16	0.18	0.15	0.17	0.19	0.16	0.17	0.24	0.21	0.23
0.10	0.08	0.09	0.08	0.11	0.09	0.10	0.08	0.08	0.11	0.12	0.11
0.14	0.13	0.13	0.13	0.17	0.16	0.33	0.21	0.27	0.22	0.21	0.21
0.15	0.14	0.15	0.11	0.12	0.12	0.10	0.17	0.14	0.18	0.17	0.18
0.25	0.28	0.26	0.26	0.21	0.22	0.27	0.21	0.23	0.58	0.55	0.57
0.26	0.20	0.24	0.21	0.23	0.22	0.26	0.25	0.26	0.54	0.48	0.51
0.20	0.22	0.21	0.28	0.26	0.27	0.24	0.25	0.24	0.32	0.33	0.33
0.21	0.20	0.21	0.22	0.19	0.20	0.19	0.25	0.23	0.31	0.29	0.30
0.12	0.16	0.14	0.16	0.15	0.15	0.24	0.15	0.20	0.20	0.22	0.21
0.11	0.08	0.10	0.08	0.09	0.09	0.13	0.13	0.13	0.13	0.12	0.13
0.13	0.08	0.11	0.13	0.11	0.12	0.07	0.07	0.07	0.15	0.09	0.12
0.18	0.27	0.23	0.13	0.22	0.20	0.18	0.21	0.19	0.28	0.32	0.30
0.08	0.07	0.08	0.06	0.07	0.07	0.02	0.08	0.08	0.12	0.12	0.11
0.10	0.10	0.10	0.06	0.07	0.06	0.11	0.10	0.11	0.17	0.16	0.16
0.12	0.17	0.15	0.14	0.20	0.18	0.15	0.23	0.19	0.22	0.25	0.24
0.07	0.08	0.09	0.08	0.07	0.08	0.09	0.08	0.09	0.13	0.12	0.13
0.31	0.54	0.46	0.23	0.42	0.37	0.47	0.35	0.42	0.75	0.84	0.81
0.08	0.10	0.09	0.10	0.12	0.11	0.07	0.08	0.07	0.13	0.17	0.15
0.12	0.17	0.15	0.14	0.17	0.15	0.11	0.18	0.15	0.27	0.31	0.30
0.06	0.06	0.06	0.04	0.04	0.04	0.04	0.06	0.05	0.06	0.06	0.06
0.07	0.12	0.10	0.09	0.14	0.12	0.10	0.16	0.13	0.13	0.17	0.15
0.08	0.09	0.09	0.08	0.08	0.08	0.08	0.07	0.07	0.08	0.10	0.09
0.11	0.12	0.11	0.11	0.12	0.10	0.09	0.15	0.13	0.20	0.19	0.17
0.08	0.08	0.08	0.06	0.05	0.05	0.07	0.08	0.08	0.11	0.11	0.11
1.97	2.27	2.12	1.36	1.93	1.70	1.77	2.61	2.15	5.48	5.46	5.49

7%, in spatium inter V and A, from the initial 17.5% to about 8%. The greatest drop could be observed in latitudo pedunculi caudae, from the initial 23.4% to a level of about 8%. This is also true of the changes in variability of head features, e.g.: the variability of barbels from the initial 17.6% to about of 8%. The variability of adult gudgeon is greater than in age classes.

Those facts are illustrated by Tables 9 and 10. On the basis of these Tables it would appear that the stabilizing effect of variability observed in carp exists also in river gudgeon population. During growth the variability

Table 8. Coefficients of variation for the 35 investigated

Age class	1+		2+	
Number of investigated gudgeon	**14**	15	9	24
Sex	♂♀	♂	♀	♂♀
Feature*)				
longitudo totalis	8.5	9.6	5.9	8.5
longitudo corporis	8.8	6.1	6.1	6.1
longitudo praenalis	9.2	5.9	7.6	6.4
longitudo praeventralis	11.7	6.8	10.9	6.7
longitudo pedunculi caudae	13.5	17.3	12.4	16.4
longitudo trunci	10.2	6.1	8.0	9.2
longitudo P	10.5	6.9	4.1	7.7
longitudo V	11.8	8.3	7.2	7.8
summa altitudo A	8.6	7.9	7.0	8.0
longitudo pinnae C superior	10.1	6.0	9.1	7.3
longitudo pinnae C inferior	9.1	6.7	7.6	6.9
longitudo pinnae C media	13.3	7.8	8.0	8.1
summa altitudo D	9.9	7.2	7.5	7.5
longitudo basis D	12.7	10.7	11.0	10.8
distantia praedorsalis	8.9	8.3	5.5	7.5
distantia postdorsalis	10.3	7.3	6.1	6.9
spatium inter P et V	14.7	7.3	6.5	6.9
spatium inter V et A	17.5	8.1	10.4	8.8
spatium inter anum et A	7.8	12.8	17.3	14.2
spatium inter anum et V	12.0	7.2	6.3	6.9
longitudo basis analis	16.3	11.2	15.9	12.9
summa altitudo corporis	18.2	8.4	8.4	8.4
minima altitudo corporis	11.5	8.8	10.3	9.3
altitudo pedunculi caudae	16.2	7.9	7.3	9.3
summa latitudo corporis	15.3	10.6	11.5	11.7
latitudo pedunculi caudae	23.4	7.2	16.3	11.2
summa longitudo in circuitu	13.5	6.3	9.7	6.8
longitudo spatii postorbitalis	9.4	10.0	7.8	10.2
longitudo capitis lateralis	6.9	8.0	7.6	7.6
diameter oculi	4.0	10.6	7.3	9.6
longitudo spatii praeorbitalis	9.4	10.0	7.8	10.2
longitudo cirri	17.6	*11.8*	15.1	13.1
summa altitudo capitis	10.5	12.8	5.4	11.1
distantia inter oculos	19.9	11.1	8.0	10.5
pondus	33.7	15.1	21.2	17.2

*) The capital letters refer to the first letters of a fin

relatively decreases, hence, after the onset of stabilization it can be assumed that the growth is proportional because the variability is on the same level and the average weight considerably greater.

Table 9 shows that the relative variability in weight sharply decreases after the first year of growth while in the fourth and fifth year it remains on the same level, i.e. 8% for all gudgeon. The same can be observed in Table 10 with the morphological variability, though here is not so sharp a decrease.

The region of the Dunajec basin comprises a variety of environments.

features from the **Dunajec river system in 1963 and 1964**

3+			4+			5+			Adult gudgeon		
33	31	64	16	23	39	11	10	21	75	74	149
♂	♀	♂♀	♂	♀	♂♀	♂	♀	♂♀	♂	♀	♂♀
4.2	4.2	4.2	3.0	2.6	2.7	3.6	2.7	3.1	10.9	10.2	10.5
4.3	3.9	4.3	3.2	2.6	2.8	3.2	2.7	2.9	10.7	10.0	10.3
7.0	6.3	6.9	6.0	5.2	5.4	9.2	7.0	8.1	14.0	12.7	13.4
12.9	16.9	15.4	5.7	4.7	4.7	5.6	3.7	5.1	14.7	16.0	15.4
14.5	17.3	17.3	18.3	18.5	18.8	12.5	5.3	9.9	18.4	17.7	21.6
5.2	6.0	5.9	4.1	4.1	4.0	3.9	3.8	3.8	11.5	10.4	11.0
9.1	7.7	9.3	8.1	7.5	8.5	6.5	8.6	9.4	11.1	9.6	11.0
5.8	7.9	7.1	6.6	6.9	6.7	5.3	8.0	6.5	10.6	10.9	10.7
6.5	5.8	6.2	6.5	8.0	7.3	7.5	6.8	7.0	11.1	10.9	10.7
6.1	6.2	6.2	6.1	5.6	6.0	7.6	6.1	7.0	10.4	14.4	12.5
7.4	6.9	7.7	7.8	6.9	7.6	8.3	6.8	7.5	11.4	10.2	10.9
9.4	7.3	8.4	6.5	9.4	8.0	8.2	6.0	6.9	10.0	10.5	10.3
6.3	6.0	6.2	5.4	7.7	6.9	14.1	8.8	11.5	10.0	9.5	9.7
11.8	11.1	11.5	7.6	9.0	8.4	6.4	11.4	9.1	13.5	13.0	13.3
5.1	5.8	5.4	4.9	4.0	4.2	4.7	3.7	4.1	11.8	11.1	11.5
5.9	4.7	5.4	4.4	4.7	4.6	4.9	4.7	4.9	11.9	10.5	11.2
8.1	8.8	8.6	10.3	9.2	9.5	8.5	8.6	8.4	12.7	12.7	12.9
8.9	9.0	9.2	8.7	7.3	7.8	6.8	9.7	8.6	13.2	12.3	12.8
13.2	9.7	12.4	8.2	10.8	10.3	13.5	13.4	13.6	15.7	14.7	15.3
8.2	11.2	9.8	9.7	8.7	9.2	13.7	8.3	11.1	13.4	14.4	14.0
15.8	11.1	14.2	14.8	12.2	13.9	7.1	7.4	7.5	17.7	11.3	14.2
8.5	12.5	10.6	5.4	9.3	7.7	7.2	8.4	7.6	12.9	14.1	13.6
8.7	8.8	9.3	6.4	7.3	7.0	2.2	7.9	7.2	13.3	13.5	13.1
9.7	10.3	10.1	4.9	5.7	5.4	8.4	7.6	8.5	14.4	14.5	14.5
8.3	11.8	10.6	9.0	11.8	11.0	8.7	12.6	6.1	15.2	16.1	16.2
10.1	11.3	10.9	10.5	9.2	9.9	10.1	9.0	9.2	17.3	17.0	17.3
6.9	9.0	7.7	3.6	6.0	5.4	6.5	4.7	5.7	12.3	13.1	12.9
6.0	10.6	8.7	7.7	11.4	9.9	8.2	12.4	10.0	11.9	15.1	13.6
4.6	6.5	5.6	4.9	5.7	5.3	3.8	5.8	4.9	10.3	11.6	11.0
9.8	10.6	10.0	6.3	5.8	5.8	6.3	9.9	8.5	11.4	9.5	10.6
6.0	10.6	8.7	7.7	11.4	9.9	8.2	12.4	10.0	11.9	15.1	13.6
12.4	15.1	13.8	12.5	11.8	11.9	11.6	10.0	10.6	13.3	15.5	14.6
7.3	7.7	7.5	6.7	7.0	6.0	5.1	8.6	7.0	12.8	11.9	11.2
11.6	11.9	12.0	7.7	5.9	6.7	8.3	9.9	9.1	14.8	15.1	15.0
13.8	15.8	14.8	6.8	9.3	8.4	6.8	16.1	8.3	33.5	31.5	32.6

The smallest variability was found in the Rogoźnik stream, there being one station investigated with 10.3% variability. It is characteristic that in the upper reaches of the Dunajec basin no gudgeon were found. The two similar environment i. e. Biała river and lower Dunajec had the same variability. This was probably due to the variety of environments in the higher lying rivers. Table 11 illustrates these facts.

In Table 9 some differences in variability can be seen between the sexes, the variability in females seeming to be greater than in males, while the stabilizing effect of variability appears in both sexes. The data of the river

Table 9. Diminution and stabilization in weight variability (v %) during the growth in gudgeon populations of the Dunajec river basin. Data from Soła river given for comparison

Age class	Dunajec river basin							Soła river		
	Males		Females		All		average weight in g	All		average weight in g
	N	v%	N	v%	N	v%		N	v%	
1+					14	33.7	4.3	5	19.3	4.8
2+	15	15.1	9	21.2	24	17.2	9.7	12	15.2	10.8
3+	33	13.8	31	15.8	64	14.8	14.4	36	12.0	17.1
4+	16	6.8	23	9.3	39	8.4	20.4	42	7.6	23.0
5+	11	6.8	10	10.1	21	8.3	26.0	15	9.3	28.2

Soła also show a diminution of variability but the subsequent stabilization does not appear, the reason for this possibly being the insufficient number of observations in the year 5+. In the body features there were no substantial differences between the sexes, the variability being virtually the same in the two sexes; in head features there were differences but not of any importance. The diminution and stabilization can be seen for both sexes, only a slight increase in males for head features being observed. The stabilization of variabilities occurs from the fourth year on.

Table 10. Diminution and stabilization of morphological variability (v%), averages of 27 body features and 7 head features

Age class	Body features (averages of variation coefficients)						Head features (averages of variation coefficients)					
	Males		Females		All		Males		Females		All	
	N	v%	N	v%	N	v%	N	v%	N	v%	N	v%
1+					14	12.4					14	12.5
2+	15	8.4	9	9.0	24	8.8	15	10.6	9	8.4	24	10.3
3+	33	8.1	31	8.8	64	8.9	33	8.2	31	10.5	64	9.5
4+	16	7.2	23	7.6	39	7.5	16	7.6	23	8.4	39	7.9
5+	11	7.6	10	7.2	21	7.4	11	7.4	10	9.9	21	8.6

COUNTS AND OTHER FEATURES

The Dunajec gudgeon had on the average 42 scales on the lateral line, 40 vertebrae, 9—10 patches on the upper part of the body (between the

Table 11. Variability of weight in v% according to the river (stream)

River or stream	Average weight in g	N	v%
Rogoźnik 1963	17.9	12	10.3
Upper Dunajec 1963	14.7	20	18.6
Poprad 1964	21.6	16	12.8
Biała 1964	17.0	72	16.2
Lower Dunajec 1964	12.0	39	16.7

Table 12. Meristic features and their variability

River or stream	N	$\bar{x}$	σ	v%	River or stream	N	$\bar{x}$	σ	v%
1. Number of scales on the lateral line									
Rogoźnik 1963	12	42.6	1.16	2.7	Upper San 1960	19	41.7	1.15	3.0
Upper Dunajec 1963	20	41.9	1.52	3.6	Middle San 1956/57	63	41.9	0.77	1.8
Poprad 1964	16	42.0	0.89	2.1	Tanew 1960	19	41.8	0.96	2.3
Biała 1964	72	42.1	1.39	3.3	Wieprz 1929	20	41.7	1.02	2.5
Lower Dunajec 1964	39	41.7	1.24	3.0	Lake Mamry 1957	20	41.5	0.94	2.3
2. Number of vertebrae					3. Patches on body				
Rogoźnik 1963	12	39.9	0.79	2.0	Rogoźnik 1963	12	9.4	1.00	10.6
Upper Dunajec 1963	20	39.5	1.19	3.0	Upper Dunajec 1963	20	9.2	0.78	8.5
Poprad 1964	16	39.6	1.17	2.9	Poprad 1964	16	9.4	0.88	9.4
Biała 1964	72	39.8	1.15	2.9	Biała 1964	72	9.7	1.06	11.0
Lower Dunajec 1964	39	39.9	1.38	3.5	Lower Dunajec 1964	39	9.9	1.93	10.4
4. Number of gill rakers					5. The length of intestine in cm				
Rogoźnik 1963	12	3.7	1.23	33.5	Rogoźnik 1963	12	8.31	0.90	10.8
Upper Dunajec 1963	20	3.7	1.27	34.7	Upper Dunajec 1963	20	7.17	1.51	21.0
Poprad 1964	16	3.6	0.72	19.8	Poprad 1964	16	8.21	1.32	16.1
Biała 1964	72	3.9	1.12	28.7	Biała 1964	72	7.78	1.57	20.2
Lower Dunajec 1964	39	2.9	0.96	32.5	Lower Dunajec 1964	39	6.11	1.21	19.8
Number of soft rays in fins									
6. Soft rays in the dorsal fin					7. Soft rays in the anal fin				
Rogoźnik 1963	12	7.25	0.45	6.2	Rogoźnik 1963	12	6.17	0.39	6.3
Upper Dunajec 1963	20	7.15	0.37	5.1	Upper Dunajec 1963	20	6.10	0.31	5.1
Poprad 1964	16	6.81	0.40	5.9	Poprad 1964	16	6.12	0.50	8.2
Biała 1964	72	6.92	0.46	6.7	Biała 1964	72	5.87	0.60	10.2
Lower Dunajec 1964	39	7.17	0.36	5.1	Lower Dunajec 1964	39	6.02	0.28	4.6
8. Soft rays in the pectoral fin					9. Soft rays in the ventral fin				
Rogoźnik 1963	12	15.42	0.79	5.1	Rogoźnik 1963	12	8.42	0.51	6.1
Upper Dunajec 1963	20	14.70	1.03	7.0	Upper Dunajec 1963	20	7.90	0.45	5.7
Poprad 1964	16	15.13	0.62	4.1	Poprad 1964	16	8.44	0.63	7.4
Biała 1964	72	14.78	0.67	4.5	Biała 1964	72	8.08	0.40	4.9
Lower Dunajec 1964	39	15.33	0.57	3.7	Lower Dunajec 1964	39	8.13	0.51	6.3

dorsal fin and the lateral line), about 4 gill rakers, 7 rays in the dorsal fin, 6 rays in the anal, 15 in the pectoral, and 8 in the ventral fins. The variability of scales was very low — on the average 3.1% — that of the vertebrae also being only 3.0%. The variability in patches was 10% and in gill rakers 31.6% which means that on the average there were changes of one patch and of one gill raker about their means. It also shows that the number of scales and the number of vertebrae are the best feature — indicators for population because of their low variability. It is interesting to note that these results are similar to those obtained by **Rolik** (1965). Data on the variability given by **Rolik** are slightly lower for scales and vertebrae, which might confirm the assumption made by that author that the temperature of early developmental stages of life may influence the growth and therefore the variability of populations living in higher streams. **Kirpičnikov** (1958) considers the soft rays in the fins as an important taxonomic feature. The variability of soft rays was very low, i.e. between 5.0 and 8.2%. Count and other seanses are indicated in tab 12

There were almost no significant differences observed in the three first features: number of scales, number of vertebrae, and number of patches on the body. For these three features there were 3 combinations of differences, each feature contributing 10 differences. In this number of 30 possible differences only two proved significant: between the populations living in the Rogoźnik and the lower Dunajec — for the number of scales and between those living in the upper Dunajec and lower Dunajec for the patches on the body. In the number of vertebrae no significant differences were observed. In the gill rakers half the possible differences were significant and half non-significant. With regard to the soft rays the differentiation between the populations was here more evident with one characteristic exception, i.e. in the soft rays of the anal fin all differences were nonsignificant, while in the three remaining fins i. e. dorsal, pectoral, and vantral aut of 30 possible differences 13 were significant. The greatest differentiation between the rivers is observed in the soft rays in the dorsal fin, 6 differences out of 10 being here significant, while in those in the pectoral fin only 3 out of 10 were significant and in the ventral fin 4 out of 10. Half the differences in the gill rakers were significant. In the length of intestine 6 out of 10 differences were significant. This shows the great influence of environment

Table 13. Fecundity of gudgeon from the Dunajec basin — May 1964

Age class	2+	3+	4+	5+	6+
Number of investigated fishes	8	16	17	7	1
Mean % weight of gonads to body weight x	18.1	14.0	13.9	13.1	12.5
Range of variation of this mean	12.0—23.7	10.3—20.0	8.2—18.7	7.7—17.3	12.5
Standard deviation σ	3.92	2.95	3.28	3.3	—
Coefficient of variation v%	21.8	21.1	23.6	23.2	—
Mean number of eggs $\bar{x}$	1721	2053	2886	3585	5610
Range of variation of this mean	918—2550	1326—2856	1632—4284	2040—5814	5610
Standard deviation σ	527.0	476.8	908.2	1160.0	—
Coefficient of variation v%	30.6	23.2	31.5	32.4	—

on these features, especially on the length of the intestines. The non-significance of differences in the first three most stable features proves that the populations of *Gobio gobio* (L.) living in the Dunajec river system do not differentiate and form one population of *Gobio gobio* species.

The fecundity of adult females was found to be higher than that given in literature. The number of eggs averaged 3585 for the 5+ years old, the only 6 year old specimen having 5610 eggs. The weight of the gonads decreased relatively with growth but the variability of percentages increased slightly in the course of time. Fecundity in gudgeon increases with age. The basic statistical analysis of fecundity is given in Table 13.

CONCLUSIONS

The *Gobio gobio* (L.) species living in the Dunajec river system belongs to the nominate form. The variability in populations decreases with age and becomes stabilized on certain levels different for morphological and weight features. This shows that the effect of stabilization occurs not only in carp populations living in ponds (Włodek, 1966b) but also in fishes living in rivers. Non-significance of means was found between gudgeon living in the 5 different habitats of the Dunajec, especially in the number of scales and the number of vertebrae. This and the non-significance of means in other features demonstrates that the populations studied belonged to one species of *Gobio gobio* (L.) which had the averages for the type and that the meristic features were not influenced by the environment. The occurence of *Gobio gobio* (L.) was similar to that in the river Soła, appearing first in the lower salmonides region and being numerous on sandy and slimy bottoms.

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The plates will be found at the end of this issue.

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A NOTE ON THE ROTIFER ADINETA OCULATA (MILNE)

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In his monograph of Czechoslovak Rotifera Bartoš (1959) stated that there were no records dealing with the bdelloid rotifer *Adineta oculata* (Milne, 1886) but that its occurrence in Czechoslovakia was probable.

This species was found in large numbers in an activated sludge laboratory model, operated at the Department of Water Technology at Praha by Ing. Dr. Petr Grau. The fatty acids were treated here successfully for many months. The actual reaction was maintained in acid range.

Rotifers dominated in this activated sludge. The main constituent of the rotifer fauna was *Lecane (Monostyla) pyrifomis* (Daday), about 90%, and *Adineta oculata* (Milne), about 9%. In few specimens also a *Dicranophorus* and a *Habrotrocha* were notified, but were not identified into species.

McKinney (1962) reported rotifers as indicators of an extremely stable activated sludge system, e g. the total oxidation system, where the bacterial activity is low, that only rotifers are visible as living animals. The rotifers can utilize larger fragments of activated sludge floc than can the protozoans and survive after all the free-swimming bacteria have been eaten by protozoans. According to the Figs. 21—5, p. 217 it is evident that rotifers mentioned by McKinney are bdelloids. Also Hawkes (1963) considered rotifers as indicators of better conditions of the activated sludge.

Adineta oculata found in the activated sludge was morphologically nearly identical with the original description of Milne (1886), quoted by Weber and Montet (1918), Bartoš (1959) and Rudescu (1960).

It can be easily separated from all other members of the genus by the presence of two eye-spots on the inner side of the rostrum (Figs 1—3, 6—8). Rostrum is irretractible in contradistinction to other Bdelloidea. The rostral lamellae are very striking (Figs 1, 2, 6—8). The body is longish and flat (Fig. 10). There is an enlargement in the middle of the trunk (Fig. 1) diminishing when the body is extended (Figs 6, 7). Jaws (Figs 4, 5) are of the ramat type, are situated far from the mouth-opening and cannot be exserted from it. Denal formula: 2/2. The foot consists of 4 false segments. There are 2 spurs and 3 long toes (Fig. 9). The specimens are moving lively, changing often their direction and adhering from time to time by the toes on the spot (Fig. 8). There are no leech-like movements or gliding as with the other Bdelloidea. Also contractions of the whole body occur often. The length of the extended body was 350 μm (**Donner**, 1965 and **Rudescu**, 1960 give up to 500 μm), dimmensions of the contracted body (Fig. 3) are 70 × 65 μm, mastax 14 μm in length.

The natural habitat is the littoral zone with makrophytes, especially *Potamogeton*. The records published (England, France, Belgium, Germany, Switzerland, Poland, Roumania, South America) and the occurrence in the activated sludge allow the following preliminary saprobiological classification:

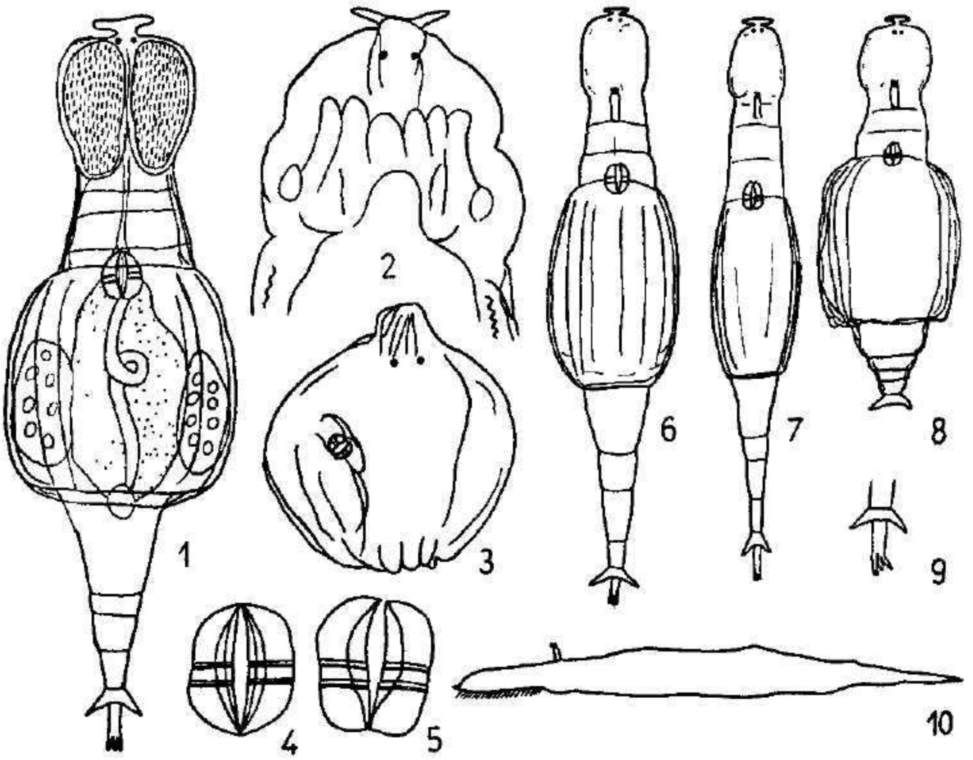

Fig. 1.: *Adineta oculata* (Milne) ventral view. — Fig. 2.: Head, not fully extended, dorsal view. — Fig. 3.: Contracted specimen, dimmensions 70 × 65 μm. — Fig. 4.: Mastax ramat. — Fig. 5.: Another mastax ramat, length 14 μm. — Fig. 6. Extended specimen, dorsal view. — Fig. 7.: Fully extended specimen, total length 350 μm. — Fig. 8: Adhering specimen, dorsal view. — Fig. 9.: Spurs and toes, dorsal view. — Fig. 10.: Lateral view of an extended specimen.

$$x = 0, \quad o = 0, \quad \beta = 7, \quad \alpha = 3, \quad p = 0; \quad G = 4; \quad S = 2,3 .$$

The species is new for the fauna of Czechoslovakia.

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IBANTILA CUBANA GEN. NOV., SPEC. NOV., THE FIRST REPRESENTATIVE OF SUBFAMILY IBALONIINAE ROEWER (ARACH., OPILIONIDEA) FROM AMERICA

VLADIMÍR ŠILHAVÝ

Received December 14, 1968

Abstract: In the paper a new genus and a new species of opilionids from Cuba are described. The new species is the first known representative of the subfamily Ibaloniinae Roewer and the first certain opilionid of the family Podoctidae (Roewer) Mello-Leitao found in America.

The members of family Podoctidae (Gonyleptomorphi) live in the tropical zone from Central Africa to Polynesia. The subfamily Erecananinae occours in the west territory of this zone (Middle and East Africa, Madagascar, Indian ocean islands, Northern Australia, Indonesia), two remaining subfamilies Podoctinae and Ibaloniinae occupy the greatest part of the tropical zone — from the islands of Indian ocean to Polynesia (Fig. 1).

From the neotropical region up to this time no representative of the family Podoctidae was known with the exception of *Brasiloctis bucki* Mello-Leitao, 1936. The appurtenance of this genus to the subfamily Podoctinae, made by

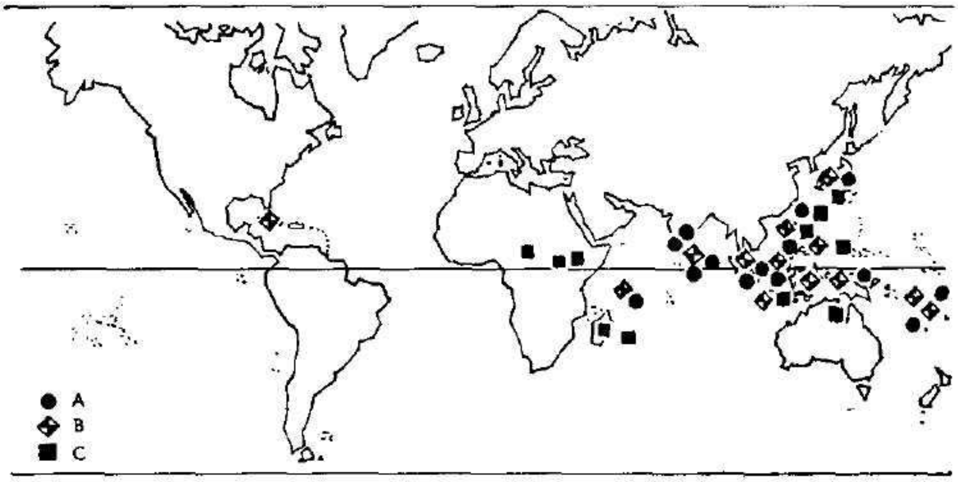


Fig. 1. Distribution of the family Podoctidae — A: Podoctinae, B: Ibaloniinae, C: Erecananinae.

Mello-Leitao, was later discussed by Roewer (1949) and proclaimed as dubious from the zoogeographical standpoint.

I was very surprised to find in the collection of opilionids from Cuba lendt me for determination from the Museum of Comparative zoology, Harvard University, Cambridge (I wish to express in this way my thanks to Dr. Herbert W. Levi for making this material avaiable for my study) one opilionid from the subfamily Ibaloniinae. It is impossible to suppose the specimen as exchanged: in the same vial ther are other typical cuban opilionids.

The detailed examination proved that this opilionid represents a new genus of the subfamily Ibaloniinae, the first genus of this subfamily from America which is distantly related to some genera from the Indian ocean islands and Polynesia.

Holotype is deposited in the collections of the Museum of Comparative zoology, Harvard University Cambridge, U.S.A.

Subordo Gonyleptomorphi

Podoctidae (Roewer, 1912) Mello-Leitao, 1938

Ibaloniinae Roewer, 1912

Ibantila gen. nov.

Without a common eye tubercle, with a large tipped elevation between eyes. This elevation is provided with some secondary spinebearing tubercles. At base of each independent eye tubercle there is an apophyse which curves downwards to touch the opposite apophyse in the anterior margin of carapace. Anterior margin of carapace with two round nothes above the basis of chelicerae, under the margin laterally above the coxa of pedipalpus one spine.

Abdominal scutum with five rather distinct areas. Areas I—IV with a pair of very low tubercles (those of the fourth area greater), first area without a median line. Free tergites and sternites unarmed, spiracles distinct. Maxillary lobe of second coxa with a ventral projection.

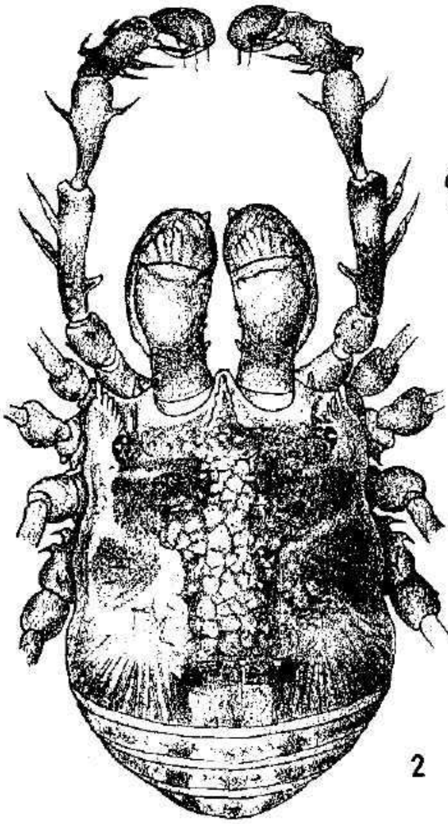
Chelicerae enlarged. Proximal segment with a few dorsal and medial spines, distal segment with some anterior and posterior spines. Scissors long, curved and with great unequal teeth.

Pedipalpus fine, all segments with spines.

Legs fines. Femur of first leg with a dorsal and ventral row of spines, patella with some dorsal spines. Other segments of the first leg and other legs unarmed. Third and fourth tarsi without pseudonychia, with two simple untoothed claws and with the distinct scopulae. Tarsal segments: 3; more than 6; 5; 5. Distitarsus of first leg with two, of second leg with three segments.

Type species: *Ibantila cubana* spec. nov.

This new genus related to the genus *Mesoceratula* Roewer, 1949, differs by the armatura of areas, by the form of the anterior margin of carapace and the position of spiracles.



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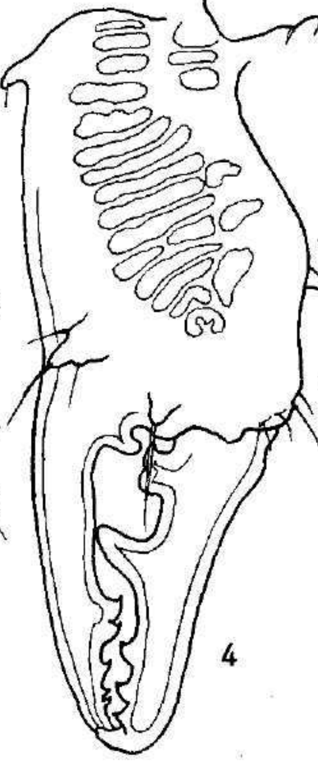

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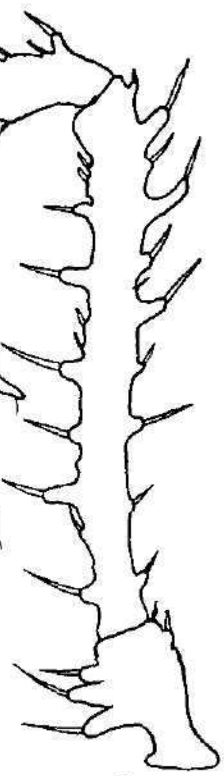

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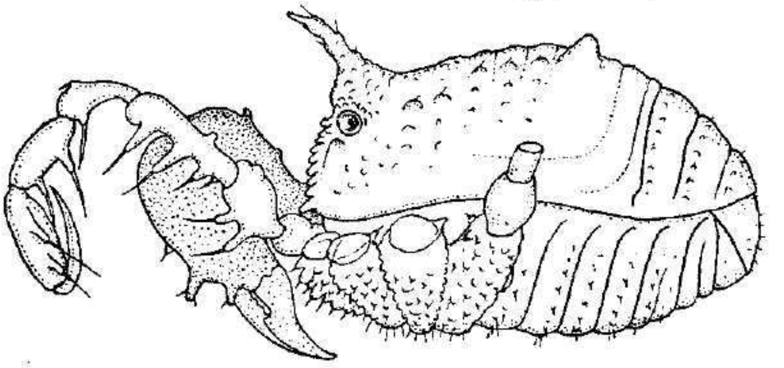

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Ibantila cubana gen. nov., spec. nov.
Fig. 2. Dorsal view of body with chelicerae and pedipalpi. Fig. 3. Lateral view of body with chelicerae and pedipalpi. *Fig. 4: Distal segment of chelicerae with scissors. Fig. 5: Trochenter,* femur and patella from the leg I.

Ibantila cubana spec. nov.

Figuros 2—7

Male holotype:

Body: Length 3,7 mm, oval.

Carapace granular, anterior margin with two round incisures above the basis of chelicers, under the margin above the coxae of pedipalp one spine. At the lateral border is the anterior margin provided with a comb of spines attaining to the eye tubercle. Eye tubercles widely separated, with a very smal spinebearing tubercles (those spines are insered laterally and directed horizontally). The anterior apophyse of eye tubercle connects with an apophyse on the anterior margin. A large pointed elevation between the eyes with very smal tubercles. The carapace behind the middle elevation with two pairs of greater tubercles provided with a small spine at the medial side which is directed at the median axis of the body. First, second and third area with a row of similar tubercles, two median tubercles greater. Fourth area with a pair of more greater tubercles, fifth area bald, free tergites and sternites with a row of hardly visible hair pointed tubercles.

Coxa I—IV with spinebearing tubercles (the greatest tubercles situated on the first coxa), second coxa apical-posterior with one, fourth coxa apical--anterior with two, apical-dorsal with one greater spinebearing tubercle. Third coxa with a row of tubercles on the anterior and posterior margin. Maxillary lobe of second coxa with a ventral projection.

Chelicerae enlarged. Basal segment with 2—3 medial and 1 lateral spine and provided with a dorsal elevation. Distal segment with two to three anterior and one posterior spine. Scissors long, curved and with great unequal teeth.

Pedipalpus 6,0 mm long, armed with greater spines: Trochanter ventrally with two spines, dorsally with two tubercules. Femur dorsally with one spine, ventrally with one spinebearing tubercle and two spinebearing spines. Other segments dorsally unarmed. Patella ventrolaterally and ventromedially with one spinebearing tubercle, tibia ventromedially with three, ventrolaterally with two spines, tarsus ventromedially with three, ventrolaterally with two spinebearing tubercles. Clav long and curved.

Legs 7—15—9—14 mm long. First trochanter with three ventral spines, first femur curved, dorsally and ventrally with a row of spines, first patella dorsally with two spinebearing tubercles. Other segments of the first leg and leg II—IV unarmed, with very low hair-pointed tubercles. Third and fourth tarsi with thick scopulae, claws smooth. Tarsal segments: 3; 9—11; 5; 5. Distitarsus of the first tarsus with two, of the second tarsus with three segments.

Penis with a strait corpus, the distal end has the form shown in fig. 6 and 7.

Colour of body and appendages reddish-brown, carapace and scutum with dark brown reticulations. Free tergites with three median darker flecks and lateral brown line, free sternites with an interrupted brown line. Chelicers with brown reticulations. Pedipalp patella with a basal, other segments with a basal and apical darker mottling. Femora of legs with a basal, medial and *apical darker mottling; patellae brown, tibiae and metatarsi I, III, and IV* with a basal, medial and apical mottling, tibia and metatarsus II brown. Tarsi I, III and IV yellowish-brown, tarsi II brown.

Type locality. Cienfuegos, Soledad, Cuba. Thomas Barbour coll. 1917 to 1918. No female specimens were found.

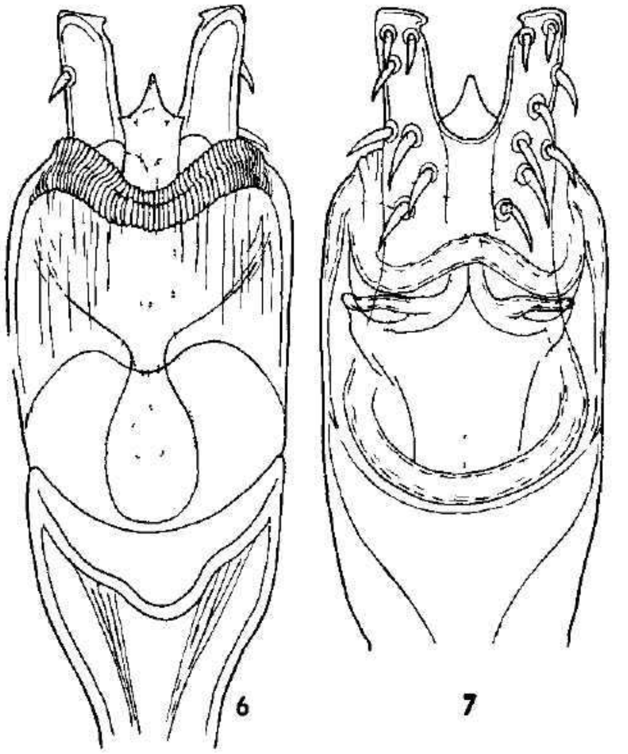

Fig. 6: *Ibantila cubana* gen nov. spec nov. Dorsal view of distal part of penis. **Fig. 7:** Ventral view of distal part of penis.

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ON THE NOMENCLATURE OF THE LARVAL STAGES OF TAPEWORMS TAENIA TENUICOLLIS RUDOLPHI, 1819 AND TAENIA HYDATIGENA PALLAS, 1766

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Received October 8, 1968

Abstract: The present paper contains a critical evaluation of the nomenclature of larval stages of *T. tenuicollis* Rud., 1819 and *T. hydatigena* Pall., 1766. As for *T. tenuicollis* Rud., 1819, in the sense of Joyeux et Baer (1936) and in accordance with the ICZN (1958), the fin of this tapeworm should be named *Cysticercus taeniae tenuicollis* (Rud., 1819). As for *T. hydatigena* Pall., 1766, in the sense of the suggested nomenclature, the fin of this tapeworm should be named *Cysticercus taeniae hydatigenae* (Pallas, 1766) and no *Cysticercus tenuicollis*. This is the only way of preventing its being mistaken for the larval stages of *T. tenuicollis* Rud., 1819.

Recently, the systematics of the genus *Taenia* Linnaeus, 1758, has been dealt with, by e.g., Freeman (1956), Dollfus (1961) and Abuladze (1964), the first two authors having dealt, above all, with *T. tenuicollis*. Basing on the above papers, we examined our material of larval stages of tapeworms *T. tenuicollis*, Rud., 1819 and *T. hydatigena* Pallas, 1766. In all, we examined 24 individuals of larval stages of *Taenia tenuicollis* and two individuals of *T. hydatigena*.

A) LARVAL STAGES OF *T. TENUICOLLIS* RUDOLPHI, 1819

They are spherical fins parasitizing the liver. They measure 2 to 5 mm. Inside the fin, there is a minute head with four suckers 0.180 mm in diameter. The head is provided with hooks situated in two circles and being of different size. The smaller ones are 0.0160 to 0.0176 mm in size; the larger ones, 0.0198 to 0.0220 mm. The total number of the hooks is 40 to 42.

This material comes from *Apodemus flavicollis* (High Tatra Mts.), *Microtus agrestis*, *M. nivalis*, *Pitymys subterraneus*, *P. tatricus* (High Tatra Mts., Roháčská Dolina Valley) and *P. subterraneus* (Stříbrnice).

Discussion

Comparing his own material with the literary data, Freeman (1956) states that the species *T. tenuicollis* Rud., 1819 and *T. mustelae* Gmelin, 1790, are identical. The descriptions of both these species by Gmelin, 1790, and Rudolphi, 1819, are taxonomically unidentifiable. Basing on hispresumption of identity and observing the principle of priority, Freeman (1956) used the name mustelae.

In accordance with Freeman (1956), Dollfus (1961) states that none of the above species can be identified on the ground of the descriptions by Gmelin (1790) and Rudolphi (1819). Dollfus (1961) applied the name *T. tenuicollis* which he considers a nomen oblitum, as it had been generally accepted.

Abuladze (1964) accepted the opinion of Dollfus (1961) and, moreover, argues in favour of the name *T. tenuicollis* that Dujardin (1845) had redescribed it. By that redescription, the species *T. tenuicollis* Rud., 1819 has been elucidated taxonomically.

Wahl (1967) is inclined towards the opinion of Freeman (1956), i.e. he observes the priority of the name by Gmelin, 1790, ignoring the study by Dujardin (1845) and the argumentation by Abuladze (1964).

In our opinion, it is necessary to respect the reasons leading Dollfus (1961) and Abuladze (1964) to the conclusion that *T. tenuicollis* Rud., 1819 is a valid species, as this species has been taxonomically elucidated by Dujardin's (1845) redescription of the adults of *T. tenuicollis* Rud., 1819 from *Mustela vulgaris (= nivalis).*

Also, it follows from the above-mentioned facts that *Taenia mustelae* Gmelin, 1790, is a nomen nudum. Gmelin's (1790) description of this species is incomplete and unidentifiable from the point of the present status of taxonomy. Moreover, the material underlying the description of this species is missing. A similar opinion was already pronounced by Thienemann (1906, cf. Abuladze, 1964).

As for the larval stages of *T. tenuicollis* Rud., 1819, Dollfus (1961) takes it for impossible to identify the fins *Cysticercus talpae* with the adults of *T. tenuicollis* Rud., 1819, as there is no material evidence. For this reason, it is impossible to accept the opinion of Abuladze (1964), suggesting that the fins of *T. tenuicollis* Rud., 1819, be called *Cysticercus talpae*. This opinion is at discordance with the International Code of Zoological Nomenclature (1958). According to this Code, the specific name pertains to all stages of the respective taxon. Hence, it is not allowed to apply to the larval stages other names than to the adults. However, it is possible to respect such denominations of the larval stages of tapeworms as already done by Joyeux et Baer (1936). To denote larval stages, these authors apply, in the latin nominative, a name expressing a certain type of fin (e.g., cysticercus, coenurus, echinococcus, etc.). To that they attach the valid name of the adult in the latin binominal genitive. It follows from their fully acceptable opinion that for the denomination of the larval stage of *T. tenuicollis* Rud., 1819, it is possible to use the name of *Cysticercus taeniae tenuicollis* (Rud., 1819).

Dollfus (1961) arrived at a conclusion that *T. tenuicollis* Rud., 1819, produces two subspecies, viz., the nominate ssp. *tenuicollis* and the ssp. *americana*. These two subspecies can be separated both according to the adults and the larval stages. As indicated by the material of Erhardová (1956) as well as by our own material, the rodents in Czechoslovakia are parazitized by fins corresponding to ssp. *tenuicollis*. In the nomenclatorical sense, they must be denoted as *Cysticercus taeniae tenuicollis tenuicollis* (Rud., 1819). The adults of this tapeworm have been recorded in Czechoslovakia e.g. by Prokopič (1965) from *Mustela nivalis, M. erminea, Martes foina* and *Putorius putorius.*

The fin is spherical or oval in shape and was found beneath the liver capsule. It is 1.5 to 2.8 cm in diameter. Inside the fin there is a bladder with a protruding head bearing two circles of hooks numbering 36. The hooks are of different size, the larger ones measuring 0.195 mm, the smaller ones 0.150 mm.

The fins were ascertained in *Sus scrofa* f. *dom.* in a slaughter house in Brno.

Discussion

Quite confusedly and at discordance with the principles of the nomenclature of the tapeworm larval stages mentioned in the preceding part, the fins of *T. hydatigena* are denominated, in literature, as *Cysticercus tenuicollis* (cf., e.g., Rudolphi, 1809, 1819; Sprehn, 1932; Neveu-Lemaire, 1936; Abuladze, 1964).

It is obvious from our conclusions in the preceding part that in this case, too, it is necessary to accept the nomenclature applied, e.g., by Joyeux et Baer (1936), that is, to denote the larval stage of *T. hydatigena* Pallas, 1766, as *Cysticercus taeniae hydatigenae* (Pall., 1766). This is the only way of preventing its confusion with the larval stages of *T. tenuicollis* Rud., 1819.

To illustrate the confusion in the literature, caused by the application of the name *Cysticercus tenuicollis* for the larval stages of both *T. hydatigena* and *T. tenuicollis*, let us mention the following examples:

1. Besides the artiodactyls, perissodactyls and primates, Sprehn (1932) also includes the insectivores and rodents among the intermediary hosts of *T. hydatigena*.

2. Neveu-Lemaire (1936) does *not include the insectivores any more* Contrary to Sprehn (1932) who includes, among the intermediary hosts, the membranes of the genera *Rattus, Mus, Microtus* and *Sciurus* of the rodents, Neveu - Lemaire (1936) statest he squirrel and the hamster only. The latter author also states the carnivores to be accidental intermediary hosts of *T. hydatigena.*

3. Among the intermediary hosts of *T. hydatigena*, Joyeux et Baer (1936) include the artiodactyls; Hovorka (1963), the herbivores and the pig; Abuladze (1964), the artiodactyls, the perissodactyls, the primates, the carnivores, the rodents as well as the lagomorphs.

To the above literary data, the following attitude must be assumed:

a) The evidence of the larval stage of *T. hydatigena* parazitizing *Talpa europaea* is given in Rudolphi (1819), stating "Cysticercus vermem Hydatide contineri". According to the same author, fins of *Cysticercus tenuicollis* are found in the members of the genus *Sciurus*. The description of materials examined by Rudolphi (1809, 1819) give no clue as to what larval stage this author investigated.

b) Cobbold (1869) ascertained larval stages of *T. hydatigena* in *Microtus arvalis;* Braun (1905), in *Mus musculus*; Theimann (1906), in *Rattus norvegicus*; Valerio (1917), in *Mus* (= *Apodemus*) *sylvaticus* (ex Kostylev et Zmeev, 1939). As the papers of the above authors lack in descriptions in the taxonomical sense, it is impossible to decide, even in these cases, whether the larval stages belonged to *T. hydatigena* or *T. tenuicollis.*

c) Similarly, Abuladze (1964) reports that Vysockaja (1947), Razumova (1953), Vasilev (1949) and Sadovskaja (1951) recorded the occurrence of larval stages of *T. hydatigena* in rodents or lagomorphs. In addition, the above author cites the discoveries of Kirschenblatt (1938 1940) and Dubinin (1953). In the Soviet literature, we ascertained another similar finding (cf. Kostylev et Zmeev, 1939). We observe that both Kirschenblatt (1938) and Dubinin (1953), Kostylev et Zmeev (1939) do not include, in their papers, descriptions of their material in the taxonomical sense. The previously mentioned papers of the Soviet authors (Vysockaja, 1947; Razumova, 1953; Vasileva, 1949 and Sadovskaja, 1951) were not available to us.

With regard to the present state of literature, it is recommended to check the occurrence of larval stages of *T. hydatigena* in insectivores, rodents and lagomorphs on new materials or to examine the materials of earlier authors if still available. The materials examined should be described in the taxonomical sense.

Recently, *artiodactyls were ascertained to be intermediary hosts of T. hydatigena* in Czechoslovakia (cf., e.g., Hovorka, 1963, Prokopič, 1965). The known hosts include *Lynx lynx* (cf. Svatoš, 1961), *Canis familiaris* (Stoklasová, 1954; Kunc, 1957; Prokopič, 1958, 1965), *Canis lupus* (Baruš, 1961; Mituch, 1962), *Vulpes vulpes* (Svatoš, 1961; Prokopič, 1965).

CONCLUSION

The present paper contains a critical evaluation of the nomenclature of larval stages of *Taenia tenuicollis* Rud., 1819 and *T. hydatigena* Pall., 1766.

As for *T. tenuicollis* Rud., 1819, rodents appear to be the intermediary hosts of its larval stages. In the sense of Joyeux et Baer (1936) and in accordance with the ICZN, the fin of this tapeworm should be named *Cysticercus taeniae tenuicollis* (Rud., 1819). The name *T. mustelae* Gmelin, 1790 should be considered a nomen nudum, as it is unidentifiable in the sense of taxonomy.

As for *T. hydatigena* Pall., 1766, ungulates are the main intermediary hosts of its larval stages. In the sense of the suggested nomenclature, the fin of this tapeworm should be named *Cycticercus taeniae hydatigenae* (Pallas, 1766). This is the only way of preventing its being mistaken for the larval stages of *T. tenuicollis* Rud., 1819.

The above examples indicate that the helminthological literature should generally accept the principles of nomenclatoric agreement between the respective type of fin, i.e. larval stage of a tapeworm and the respective adult stage. The type of the fin should be indicated in the latin nominative (cysticercus, coenurus, etc.) and supplemented by the binominal scientific name of the respective adult stage in the latin genitive (taeniae solii, taeniarhynchi saginati, etc.). The names *Cysticercus bovis*, *Echinococcus polymorphus*, *Coenurus cerebralis*, *Cysticercus racemosus*, etc., are satisfactory in the clinical sense only; they are not obligatory in the nomenclatoric sense (ICZN).

It is recommended to re-examine the data stating that the fins of T. hydatigena parasitize insectivores, rodents and lagomorphs, either on the basis of new materials or on that of the aerlier authors, if such materials are still available.

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ZPRÁVA O ČINNOSTI ČS. SPOLEČNOSTI ZOOLOGICKÉ PŘI ČSAV ZA ROK 1968

Hlavní činnost společnosti: Hlavní výbor společnosti se v uplynulém roce soustředil jen na řešení nejdůležitějších celozoologických otázek, konkrétní úkoly jednotlivých oborů byly ponechány na rozvíjejících se sekcích. Z nejdůležitějších problémů řešených na schůzích hlavního výboru to byly:

1. Byla jmenována nomenklatorická komise ve složení: prof. Kratochvíl, doc. Černý, prof. Pfeffer, doc. Štěpánek, dr. Veselovský a dr. Hanák, která navrhne obecná kritéria, podle nichž se bude řídit práce na přípravě českého zoologického názvosloví. Modelové návrhy systémů nejdůležitějších skupin připraví příslušné sekce.
2. Byl připraven a schválen statut sekcí společnosti.
3. Byla jmenována komise pro přípravu vysokoškolských učebnic zoologie (doc. Černý, prof. Sládeček, dr. Kunst), která zatím navrhla k překladu Romerovu učebnici morfologie obratlovců. Návrh byl akceptován nakladatelstvím Academia.
4. Společnost vyvinula činnost na soustředění pracovníků, kteří se zabývají faunistickým výzkumem ČSSR a jejich zapojením do společných výzkumných plánu. Přihlásilo se 20 pracovníků, jimž bylo doporučeno zapojit se do plánu katedry systematické zoologie PFUK v Praze (koordinátor doc. Černý) a do plánu výzkumu Karpatské oblasti (koordinátor prof. Korbel).
5. Byla hledána možnost vydávání zpráv společnosti, popř. i samostatného časopisu a připraveny k tisku: seznam terénních zoologických stanic, seznam čs. zoologů a seznam časopisů v knihovnách zoologické a entomologické společnosti.

Stav členstva: Čs. společnost zoologická při ČSAV měla k 31. 12. 1968 celkem 260 členů (217 řádných, 36 mimořádných, 7 čestných). V roce 1968 bylo přijato 26 mimořádných členů. Příliv členstva v r. 1968 souvisel především s aktivisací 2 nových sekcí.

Hlavní výbor: Hlavní výbor Čs. společnosti zoologické při ČSAV pracoval ve složení: doc. dr. W. Černý (předseda), akad. O. Jírovec a prof. dr. J. Kratochvíl (místopředsedové), dr. Vl. Hanák, CSc. (vědecký tajemník), dr. Fr. Lellákova, CSc. (hospodář). V roce 1968 se výbor rozšířil o předsedy dvou nových sekcí, doc. dr. J. Pelikána a dr. K. Hudce.

Knihovna: Knihovna Čs. společnosti zoologické při ČSAV měla koncem roku 1968 8160 inventárních čísel. Během r. 1968 přibylo 240 svazků (vesměs ročníků časopisů). Všechny přírůstky byly získány výměnou za časopis společnosti.

Výměna časopisu: V r. 1968 byl posílán Věstník na 442 adres. Zásoby Věstníku vzrostly v r. 1968 o 599 kusů, z toho bylo vydáno 82 ks, zásoby celkem 517 kusů. Z celkového nákladu 1000 výtisků časopisu se prodává v ČSSR prostřednictvím PNS 285 výtisků, do zahraničí prostřednictvím Artie 45 výtisků. 442 výtisků je vyměňováno za zahraniční časopisy.

Přednášky: Během roku 1968 bylo uspořádáno celkem 8 přednášek (bez pobočky Brno), většinou společně s Čs. společností entomologickou při ČSAV nebo Mammaliologickou sekcí PSSNM. Průměrná účast na přednáškách v I. pololetí byla 25 osob, v II. pololetí 75 osob.

Dr. J. Gaisler (Brno): Výzkum savců v Afganistanu.

Prof. Dr. J. Kratochvíl (Brno): Nové poznatky o rozšíření rysa.

Prof. Dr. H. Peters (Heidelberg): Rattenbekampfung und Rattenverehrung in Indien.

Prof. Dr. C. Motas (Bukurešť): Několik poznámek k jeskyním a jeskynní fauně Rumunska.

Dr. L. Dobroruka (Praha): Velcí savci jižní Afriky.

Prof. Dr. F. Sládeček (Praha): Studijní cesta v rámci UNESCO do Keni, Etiopie, Sudanu a Egypta.

Prof. Dr. J. André (Paris): La biogenèse des mitochondries.

Dr. P. Štys (Praha): Entomologické safari po Sudanu.

Exkurse: Jako každoročně byla uspořádána jen jediná exkurse do zoologické zahrady v Praze-Troji. Přes nepříznivé počasí se jí zúčastnilo asi 25 osob.

Symposia: Ve dnech 6.—9. září 1968 bylo uspořádáno na zámku Hluboká n. Vlt. dlouho připravované I. mezinárodní chiropterologické symposium. Vzhledem k mimořádným podmínkám se ho účastnilo z 87 přihlášených účastníků z 22 zemí jen 12 zahraničních hostů. I s domácími účastníky se tedy jednání účastnilo 20 lidí. Místo přihlášených 54 referátů jich bylo předneseno jen 7. Úvodní proslov přednesl předseda Čs. společnosti zoologické doc. dr. W. Černý, po něm následovaly referáty těchto účastníků: Braaksma (Vreeswijk), Daan (Amsterdam), Dorgelo (Amsterdam), Gaisler (Brno), Hanák (Praha), Neuweiler (Tubingen), Novotný (Brno), Racey (London) a Roer (Bonn) 7. a 8. září byla uskutečněna celodenní exkurse po jižních Čechách a na Moravu, kde pak navštívili Brno, jeskyně Mor. krasu a okolí Lednice. 9. září byla konference oficiálně ukončena v Lednici. Organisace symposia byla také kladně hodnocena zahraničními účastníky a vyšla o ní kladně hodnotící informace v časopise Nature. Referáty přednesené na symposiu budou společně s některými dalšími publikovány ve zvláštním svazku časopisu Lynx, který vyjde koncem roku 1969.

Sekce protozoologická: Protozoologická sekce má 30 členů, vedoucím je člen korespondent dr. Weiser. Agendu obstarává dr. Lom. Kromě pořádání pravidelných seminářů soustředila se v r. 1968 činnost skupiny na uspořádání symposia „Adaptace protozoí s parasitickým způsobem života", které bylo pořádáno ve spolupráci s PÚ ČSAV. Zúčastnilo se ho také 16 protozoologů ze zahraničí, většinou z Francie. Symposium bylo velmi úspěšné a vedlo k utužení stávající spolupráce českých a francouzských protozoologů.

Sekce ornithologická: Rok 1968 byl ve znamení snahy o organisační zajištění sekce, jejíž zřízení bylo schváleno na schůzi výboru Čs. společnosti zoologické při ČSAV dne 16. 11. 1967. Přípravný výbor svolal na 29. 3. 1968 do Brna schůzi navrženého širšího výboru. Tam byla detailně projednána náplň činnosti a organisační struktura sekce a zvolen užší výbor sekce. Současně byli zvoleni vedoucí jednotlivých pracovních úseků a usneseno, aby do podzimní členské schůze sekce si připravili vedoucí úseků náměty práce a aby tato schůze probrala především problémy faunistické práce v ČSSR. Členská schůze se pak konala v Bratislavě ve dnech 14. až 15. 12. 1968 a byl na ní zvolen nový výbor ve složení K. Hudec (vedoucí), B. Matoušek (místovedoucí), Č. Folk (jednatel), J. Hanzák, Z. Kux, A. Mošanský (členové výboru). Byla pak zhodnocena práce některých úseků a zejména projednány problémy faunistiky. Ke všem jednáním byla přijata řada konkrétních usnesení. Ke konci r. 1968 měla sekce 61 členů řádných i mimořádných.

Sekce theriologická: V minulém roce se soustředila činnost prozatímního výboru sekce na práce spojené se založením sekce a s vybudováním členské základny sekce. Všem zájemcům o práci v sekci bylo rozesláno během roku oznámení o založení sekce, spolu s rámcovým plánem práce a s náplní činnosti sekce a s přihláškou ke vstupu do sekce. Akce se setkala se zájmem a do sekce se prozatím přihlásilo asi 40 členů. Připravuje se pracovní schůzka do Brna v březnu, kdy bude provedena řádná volba výboru a prodiskutována další činnost sekce. Současně je plánována spolupráce a účast na konferenci theriologů, která má být svolána do Zvolenu. V roce 1968 se vedení sekce účastnilo především organisace I. mezinárodního chiropterologického symposia.

Sekce ichthyologická: Ischthyologická sekce Slovenské zoologické společnosti byla založena v lednu 1967. Bylo dohodnuto celostátní působení sekce a sídlo sekce v Bratislavě. Hlavní úsilí sekce v r. 1968 bylo zaměřeno k uspořádání mezinárodní konference o určování stáří a rychlosti růstu ryb. Celkem se přihlásilo 49 ichthyologů z 10 států. Pro účely konference byl vydán sborník z přihlášených vyžádaných referátů a sestavena bibliografie ichthyologických prací v ČSSR v letech 1945—67. Srpnové události zabránily konání konference. Konference je proto plánována na 3.—6. září 1969 do Smolenic. V současné době má sekce 34 členů.

Pobočky: Moravská pobočka v Brně. V roce 1968 se soustředila činnost brněnské pobočky, stejně jako v letech minulých, na popularisaci ve formě přednášek, pořádaných ve spolupráci s Přírodovědeckým klubem při Mor. muzeu v Brně. Přednášek bylo celkem šest. Někteří členové pobočky se podíleli organisačně na práci v nově vzniklých sekcích ornithologické a theriologické. Sekce ornithologická měla v Brně tr. dvě zasedání organisačního charakteru. Většina členů odbočky se účastnila též Biogeografické konference v Brně.

Vladimír Hanák

RECENSE — REVIEWS

Alfred Sherwood Romer (1966): Vertebrate Paleontology. The University of Chicago Press, Chicago & London, 3. vydání, X + 468 str., 443 obr., 4 tab. Cena: US $ 10.00.

Romerova paleontologie je souhrnem historie obratlovců, jejich evoluce a výčtem nejzákladnějších forem vyhynulých vertebrátů. Vydání z roku 1966 (3. vydání) je pokračováním ve vydáních předešlých, která vyšla v roce 1933 a 1945. Není třeba zvlášť zdůrazňovat, a obzvláště ne u autora jména Romerova, že nové vydání není jen pouhým přetiskem předešlých, nýbrž, že jde o reedici, která je doplněna a přepracována tak, aby byla v souhlase s posledním stavem bádání, a to jak na poli paleontologie a evoluce, tak i přilehlých vědních oborů.

Ve většině recensí bývá Romerovo dílo charakterisováno jako standardní učebnice paleontologie. Budiž zde však řečeno, že jde o dílo, které je i něčím více. Vedle zasvěceného výkladu problémů paleontologie obratlovců přináší kniha i celou řadu důležitých a velmi potřebných informací z četných přilehlých oborů — anatomie, taxonomie, fysiologie, ekologie atd. Rovněž seznam literatury přesahuje daleko rámec výběru titulů, které bývají citovány v učebnicích.

Dá se říci, že „Vertebrate Paleontology" je partnerským dílem jiné, stejně významné a důležité Romerovy publikace — anatomie obratlovců („The Vertebrate Body", 3. vyd., 1932).

Proti předešlým vydáním doplnil autor ve třetím vydání „Vertebrate Paleontology" zejména ty části, kde byl pokrok vědy za posledních 20 let nejcitelnější. Tak byly zcela revidovány části týkající se ryb v nejširším slova smyslu a části týkající se obojživelníků. Výrazné zásahy lze pozorovat i v kapitolách týkajících se některých skupin plazů a primitivních skupin savců (např. řády Insectivora, Creodonta aj.). Nové vydání bylo obohaceno i v obrazové části, do níž autor včlenil na 160 nových vyobrazení a diagramů.

Závěrem lze říci, že „Vertebrate Paleontology" profesora Romera představuje ve svém novém vydání jednu z nejzákladnějších a nejúplnějších učebnic a příruček paleontologie a stává se nezbytným dílem pro každého, koho vede pracovní zaměření jakýmkoliv způsobem k zájmu o fosilní obratlovce. Podotkněme ještě, že pokud jde o Vertebrata, je Romerovo dílo skvělým doplňkem a příležitostí ke konfrontaci s poněkud rozsáhlejším a úplnějším dílem „Osnovy paleontologii", které vyšlo v řadě svazků v SSSR (Moskva 1962—1964) pod hlavní redakcí prof. J. A. Orlova.

Vratislav Mazák

Richard E. Blackwelder (1967): Taxonomy. A text and reference book. John Wiley & Sons, Inc., New York—London—Sydney, XVI + 698 str., obr., 1. vyd., Cena: US $ 25.00.

Obsáhlá publikace prof. R. E. Blackweldera ze Southern Illinois University se zabývá problémy moderní taxonomie z nejširšího měřítka a vyčerpává thema od těch nejjednodušších praktických aspektů (jako je sbírání, identifikování a udržování materiálů) až po problémy nejsložitější a aspekty ryze teoretické (otázky species a subspecies, obecné problémy klasifikace, theoretický význam taxonomie atd.). Autor se snažil, aby do mnohých složitých otázek přinesl co nejširší škálu různých názorových pohledů. Kniha profesora Blackweldera se tak stává do určité míry konfrontací rozličných koncepcí, které dnes mezi předními světovými taxonomy lze zaznamenat. Autor využil základních moderních prací svých amerických kolegů Mayra, Simpsona, Dobzhanského a dalších, stejně tak, jako klasických prací evropských autorů, kteří se taxonomii a systematice teoreticky věnovali, z nichž v prvé řadě je třeba jmenovat J. S Huxleyho.

Kniha je zpracována tak, že je přístupná nejen specialistům pracujícím v oboru již delší dobu, ale i studentům a pracovníkům, kteří se systematikou a taxonomií nezabývají ještě dlouho. V každém případě je však třeba mít na zřeteli, že publikace je zasvěcena thematu do značné míry speciálnímu a že klade na čtenáře dosti značné nároky.

Kniha je rozdělena do šesti obsáhlých částí, které na sebe v logickém sledu navazují: I. Introduction, II. Practical Taxonomy, III. The Diversity to be Classified, IV. Classification, Naming, Description, V. Theoretical Taxonomy, VI. Zoological Nomenclature. Publikaci pak uzavírá rozsáhlý seznam literatury, který přináší na 700 citací jednotlivých prací, a velmi detailně uspořádaný rejstřík autorský a věcný.

Taxonomii profesora Blackweldera lze plně doporučit každému zoologovi, který se ve své práci střetává s těmi problémy, jimž je kniha zasvěcena. Základní přínos této publikace lze vidět v již zmíněné konfrontaci různých názorových koncepcí, doprovázené často vlastními názory a kritikou autora.

Vratislav Mazák

VĚSTNÍK
ČESKOSLOVENSKÉ
SPOLEČNOSTI ZOOLOGICKÉ

ACTA SOCIETATIS
ZOOLOGICAE
BOHEMOSLOVACAE

Svazek XXXIII

V Praze 1969

NAKLADATELSTVÍ ČESKOSLOVENSKÉ AKADEMIE VĚD V PRAZE

OBSAH — CONTENTS

Roč. Tom. 33—1969

Datum vyjití jednotlivých sešitů **1.—14. 2. 1969** **2.—20. 5. 1969**

Date of offearance of the numbers **3.—11. 8. 1969** **4.—11. 11. 1969**

VĚSTNÍK ČESKOSLOVENSKÉ SPOLEČNOSTI ZOOLOGICKÉ
ročník XXXIII

Vydává Čs. společnost zoologická v Academii, nakladatelství ČSAV, Vodičkova 40,
Praha 1 - Nové Město, dod. pú. 1.

Tiskne Státní tiskárna, n. p., závod 4, Praha 10 - Vršovice, Sámova 12, dod. pú. 101.

Rozšiřuje Poštovní novinová služba. *Objednávky a předplatné PNS* — ústřední expedice tisku administrace odborného tisku Jindřišská 14, Praha 1. Lze také objednat u každé pošty nebo doručovatele.

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Toto číslo vyšlo v listopadu 1969.

Dashdorzh A , A Dulmaa, K. Pivnička 1969

Contribution to the systematics of the genus Oreoleuciscus Warpachowski, 1899 (Cyprinidae)

Věst Čs spol zool. **33** : 289 – 299

Dobroruka L 1969

Verlauf des Haarwechsels bei einigen Hirschen (Artiodactyla Cervidae)

Věst. Čs spol zool. **33** : 300 – 312

Fott J., V. Sládeček **1969**

A note on the rotifer Collotheca **breviciliata Berzins.**

Věst Čs spol zool **33** : 313 – 314

Hanák V **1969**

Zur Kenntnis von Rhinolophus bocharicus Kastschenko et Akimov, 1917 (Mammalia Chiroptera)

Věst. Čs. spol. zool **33** : 315 – 327

Hensel K 1969

The first found of natural sturgeon hybrid Acipenser ruthenus Linnaeus, 1758 × Acupenser guldenstadti colchicus Marti, **1940** in the Danube

Věst Čs spol zool **33** 328 – 330

Heráň I **1969**

Irregularities in the formation of the mandibular joint in Eira barbara (Linnaeus, 1758) (Mammalia: Mustelidae)

Věst. Čs. spol zool. **33** : 331 – 333

Holčík J. **1969**

Discovery of the Chinese grass carp – Ctenopharyngodon idella (Valenciennes, 1844) in the Morava river, Czechoslovakia

Věst Čs spol zool **33** : 334 – 336

Oliva O., V. Skořepa **1969**

The myodome in some Teleosts.

Věst, Čs spol, zool. **33** : 337 – 350

Skóra S , J M. Włodek 1969

The gudgeon (Gobio gobio [L.]) from the Dunajec river basin.

Věst. Čs. spol. zool. **33** . 351 – 368

Sládeček V **1969**

A note on the rotifer Adineta oculata (Milne)

Věst. Čs. spol. zool **33** : 369 – 371

Šilhavý V. 1969

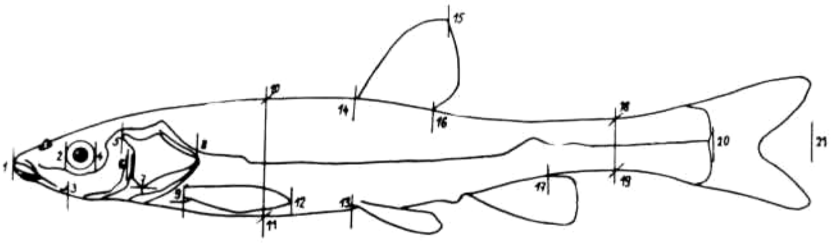
Ibantila cubana gen nov , spec nov , the first representative of subfamily Ibaloniinae Roewer (Arach., Opilionidea) from America

Věst Čs spol zool **33** · 372 – 376

Tenora F , M Vaněk 1969

On the nomenclature of the larval stages of tapeworms Taenia tenuicollis Rudolphi, 1819 and Taenia hydatigena Pallas, 1766.

Věst. Čs. spol. zool. **33** : 377 – 381



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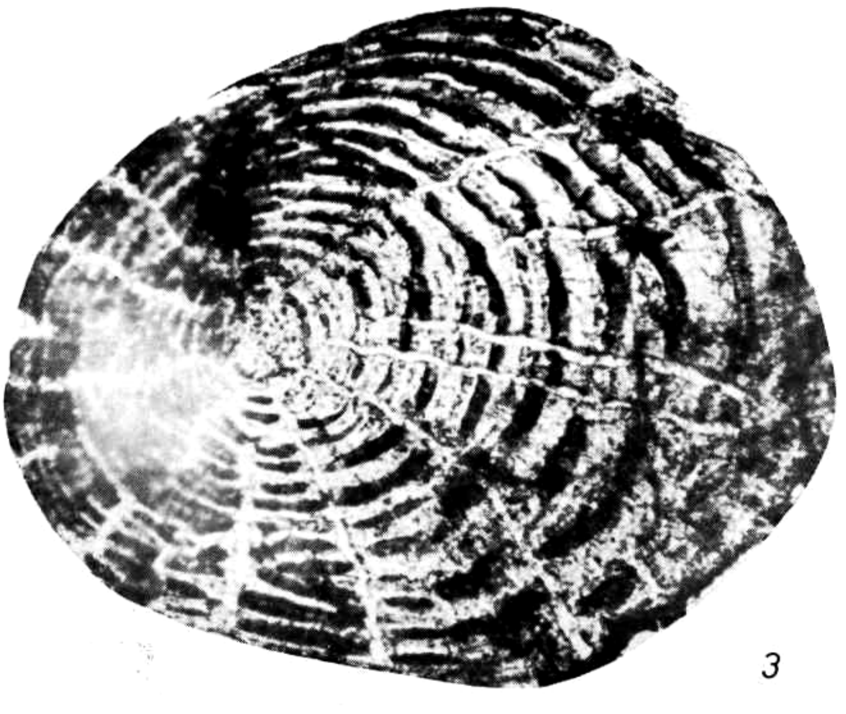

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Fig. 2. Scheme of measurements of genus *Oreoleuciscus* used in present paper. 1–21 Total length, 1–20 Standard length (body length), 1–8 Head length, 1–2 Preorbital distance, 1–14 Predorsal distance, 1–3 Length of mandibule, 9–13 Distance P–V, 5–8 Length of opercule, 9–12 Length of P, 5–7 Height of opercule, 4–8 Postorbital distance, 6–8 Length of the cheek, 10–11 Maximal body height, 18–19 Minimal body height, 14–15 Height of D, 17–20 Length of caudal peduncle 16–20 Postdorsal distance.

Fig. 3. Scale of *O. humilis* with radial canals. The scale was taken out from the middle of the body. Approx. × 30.

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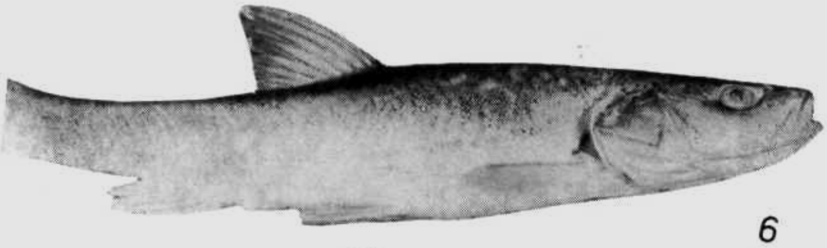
Fig. 4. Scale of *O. potanini* with radial canals. Taken out from the same place as in Fig. 3. Approx. ×40.
Fig. 5. Scale of *O. pewzowi* with radial canals. Taken out from the same place as in Fig. 3. Approx. ×40.



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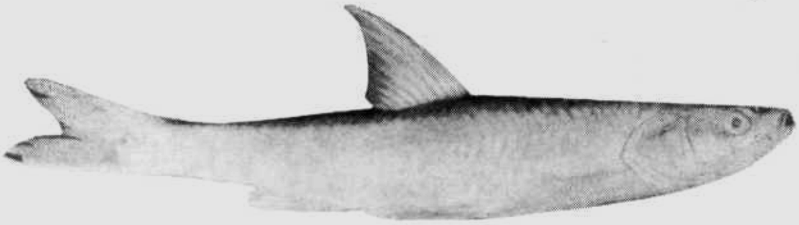

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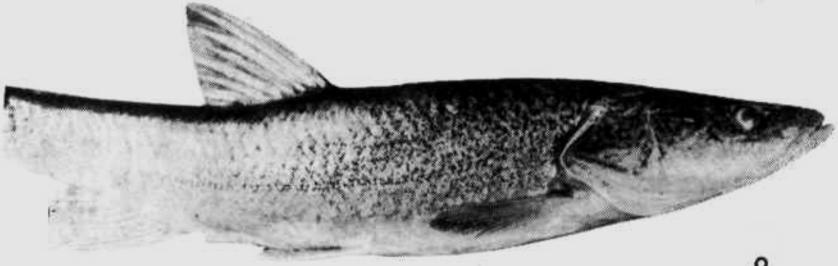

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Fig. 6. *O. potanini* from Lake Khar. Actual body length 28.7 cm.
Fig. 7. *O. potanini* from Lake Khar. Actual body length 17.6 cm.
Fig. 8. *O. pewzowi* from Lake Achit. Actual body length 31.7 cm.
Fig. 9. *O. humilis* from river Tasarkhain. Actual body length 9.8 cm.

10

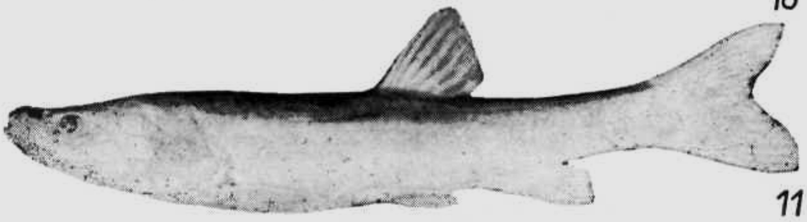

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Fig. 10. *O. pewzowi* from Lake Sangin Dalai. Actual body length 26.0 cm.
Fig. 11. *O. pewzowi* from the river Baidaragin. Actual body length 15.1 cm.
Fig. 12. *O. humilis* from the river Tatsyn. Actual body length 12.9 cm.
Fig. 13. *O. humilis* from the river Teisin. Actual body length 12.0 cm.
Fig. 14. *O. humilis* from the river Tuin. Actual body length 12.0 cm.

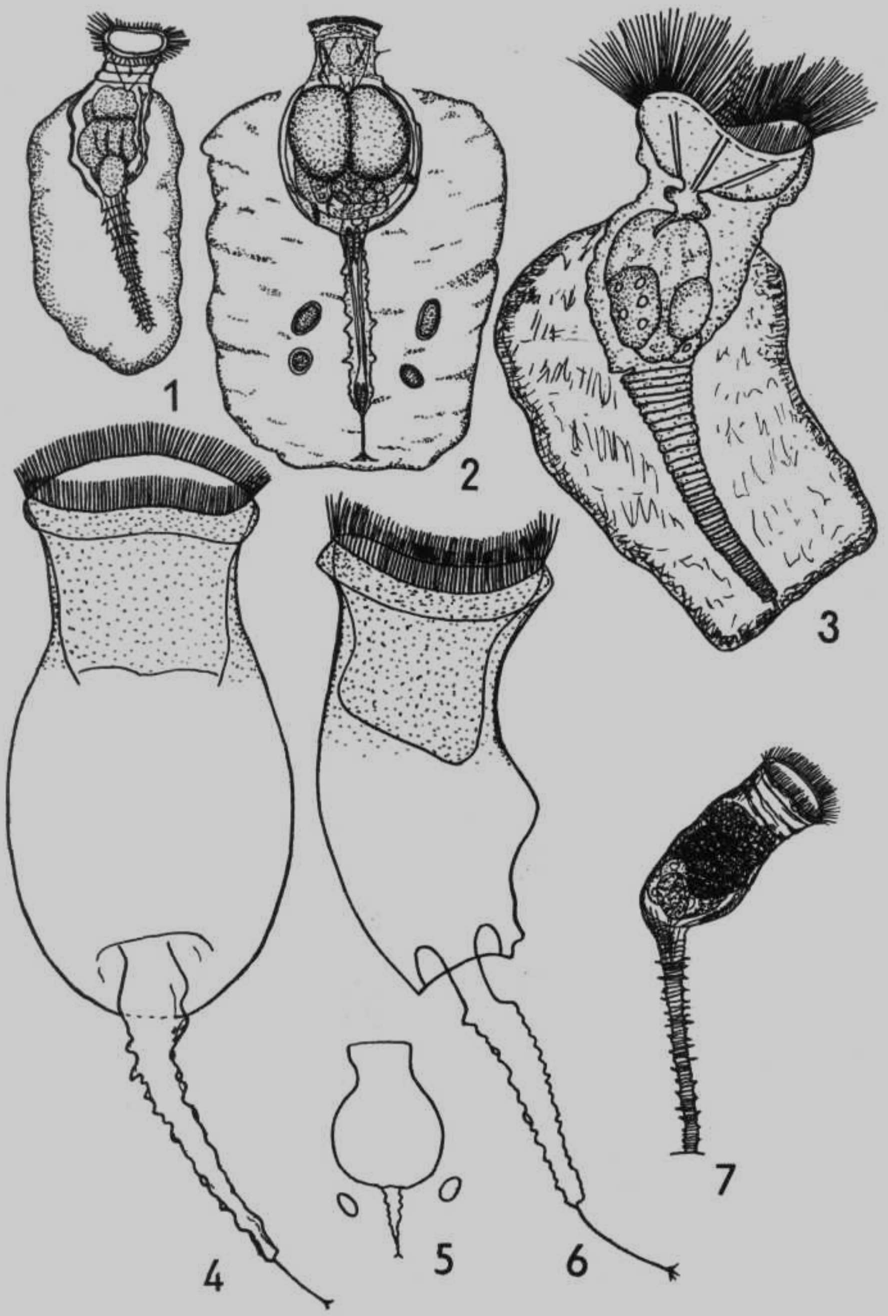


Fig. 1. *C. edentata* Collins, according to Bartoš, 1959, p. 877. — Fig. 2. *C. breviciliata* Berzins, according to Berzins, 1951, p. 591. — Fig. 3. *C. edentata* according to Rudescu, 1960, p. 1132. — Fig. 4. *C. breviciliata*, orig. Fott, total length 580 μm. — Fig. 5. General shape of *C. breviciliata* with 2 eggs, orig. Fott. — Fig. 6. A juvenile *C. breviciliata*, orig. Fott, total length 255 μm. — Fig. 7. *C. breviciliata* according to Frič and Vávra, 1897.

Holčík J.: Discovery of the Chinese grass carp — **Ctenopharyngodon idella** (Valenciennes, 1844) in the Morava river, Czechoslovakia.

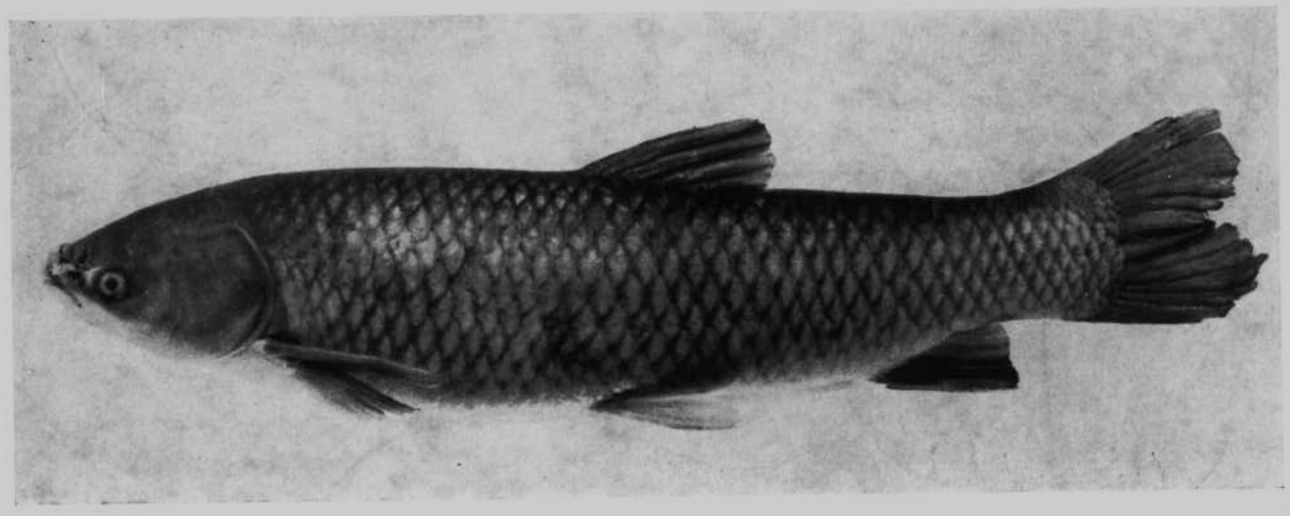


Fig. 1: Grass carp record from the Morava river (phot. Šimeková).

Holčík J.: Discovery of the Chinese grass carp — Ctenopharyngodon idella (Valenciennes, 1844) in the Morava river, Czechoslovakia.

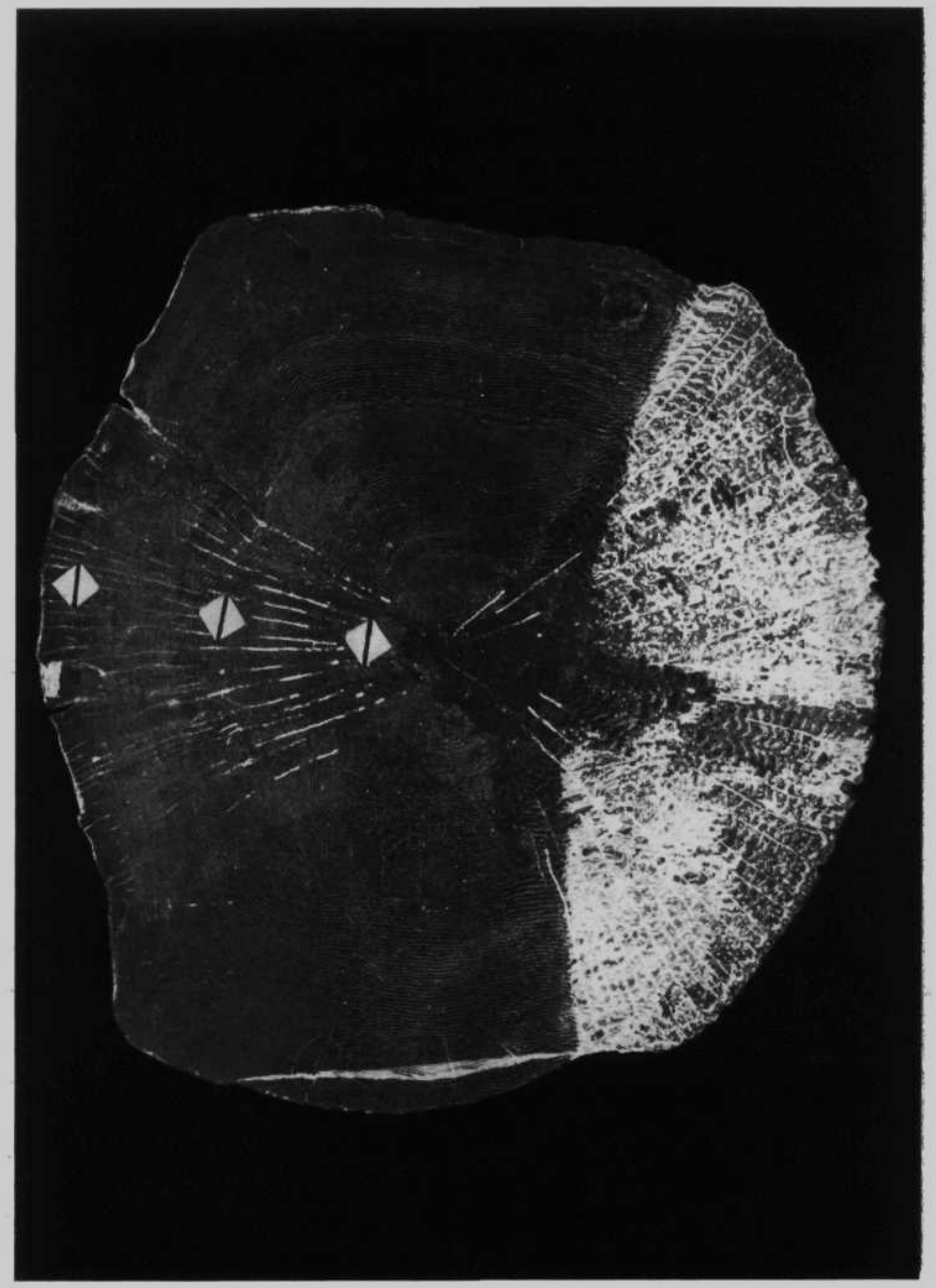
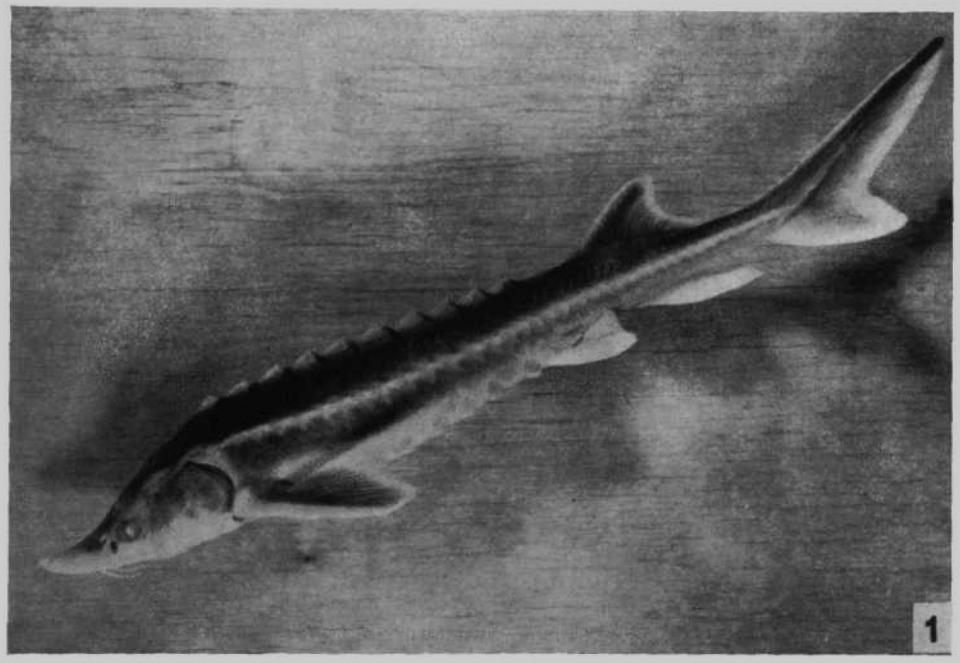


Fig. 2: The scale of the Morava river grass carp showing three complete annuli and a new increment.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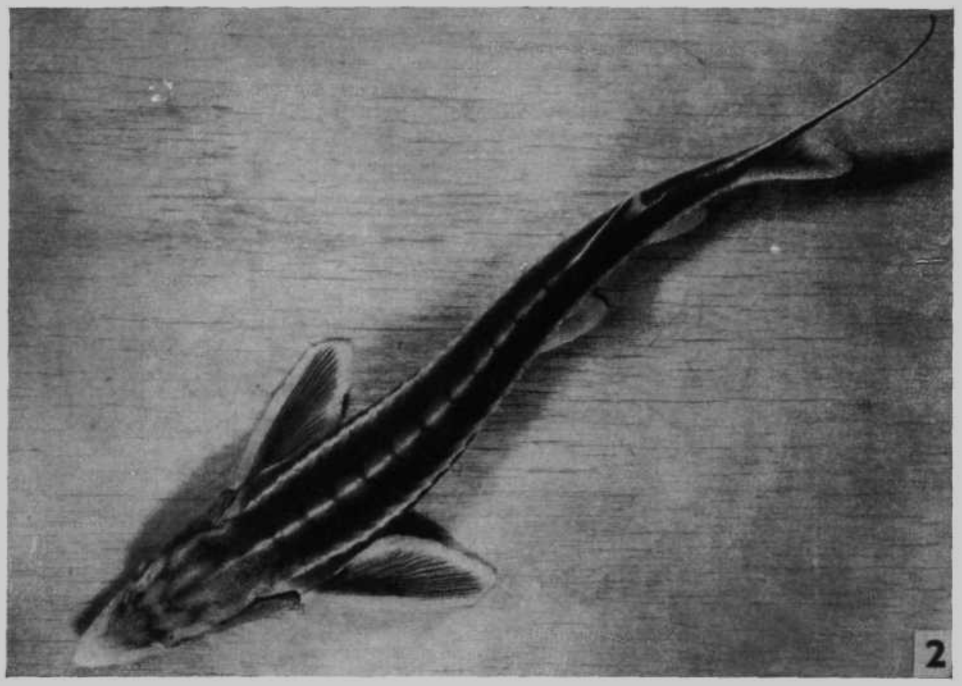
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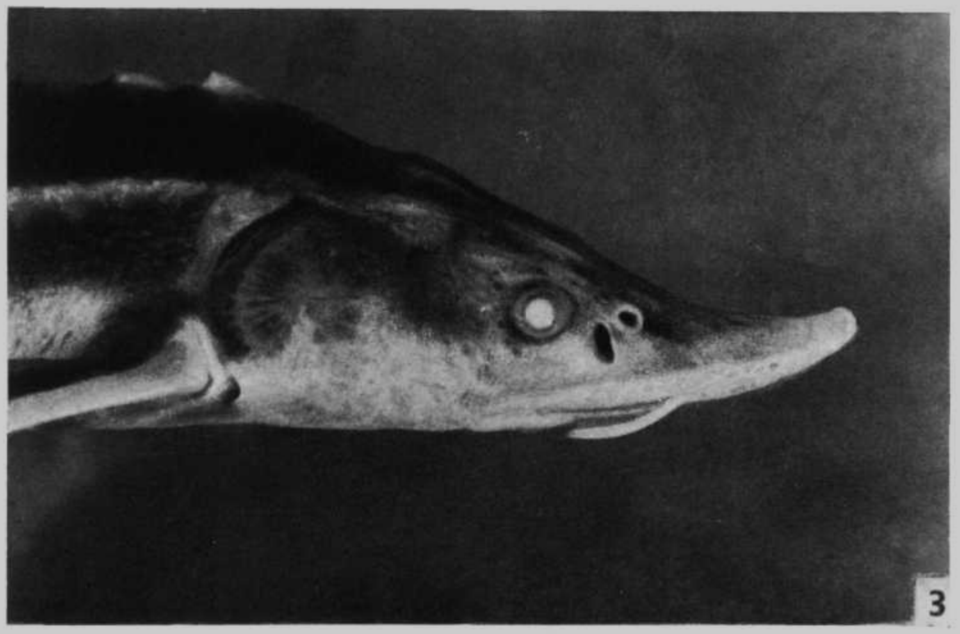
Plate I, fig. 1 — Natural sturgeon hybrid Acipenser ruthenus Linnaeus, 1758 × Acipenser güldenstädti colchicus Marti, 1940, total length 324 mm; lateral view.

Fig. 2 — The same specimen, dorsal view.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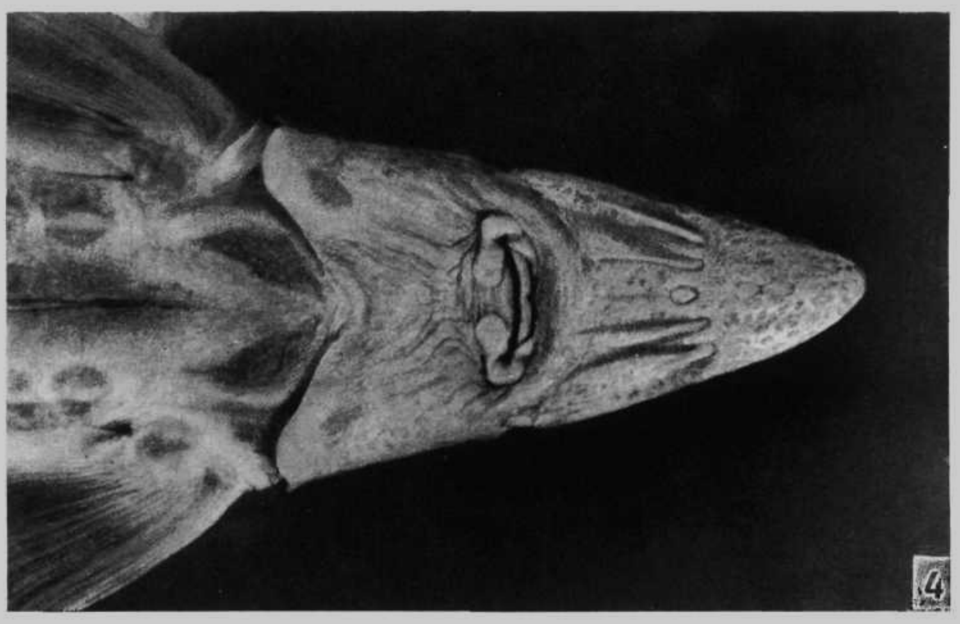
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Plate II, fig. 3 — The same specimen, lateral view of the head.
Fig. 4 — The same specimen, ventral view of the head.

Heráň I.: Irregularities in the formation of the mandibular joint in *Eira barbara* (Linnaeus, 1758) (Mammalia: Mustelidae)

Fig. 1: *Eira barbara* (L.), skull no. 23104. Left and right processus articularis mandibulae, caudal view.

Fig. 2. *Eira barbara* (L.), skull no. 14218. Left and right processus articularis mandibulae, ventrocaudal view.

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Fig. 3. *Eira barbara* (L.), skull no. 23104. Detailed view of the left mandibular joint from the ventrocaudal aspect. Black arrows show the dividing line of joint surfaces of fossa mandibularis (above) and processus articularis mandibulae (below).

Fig. 4: *Eira barbara* (L.), skull no. 14218. Detailed view of the left fossa mandibularis from ventral side.

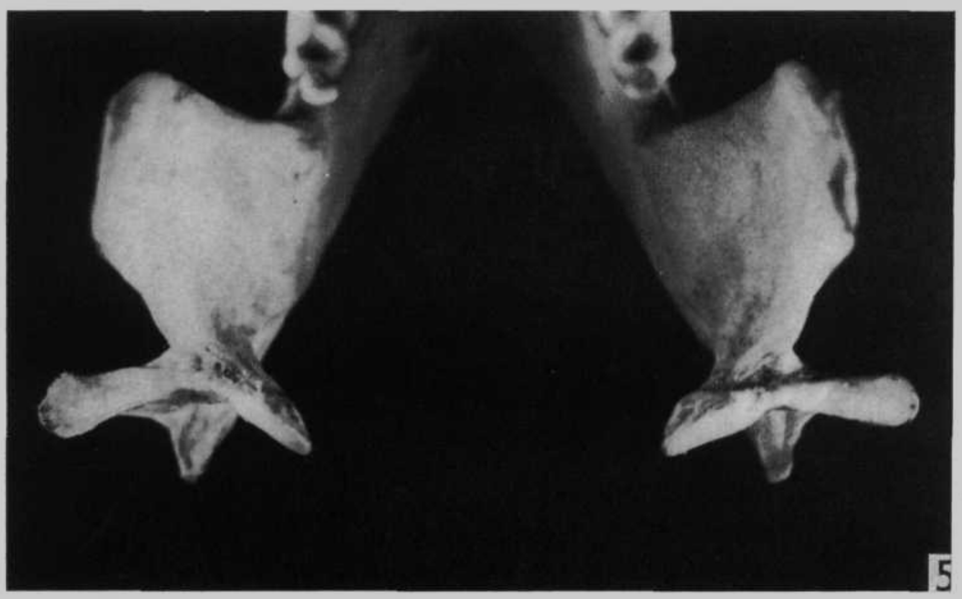

Fig. 5: *Eira barbara* (L.), skull no. 23103. Left and right processus articularis mandibulae, vertical view.

Fig. 6: *Eira barbara* (L.), skull no. 23103. Detailed view of the right processus articularis mandibulae from caudal aspect.

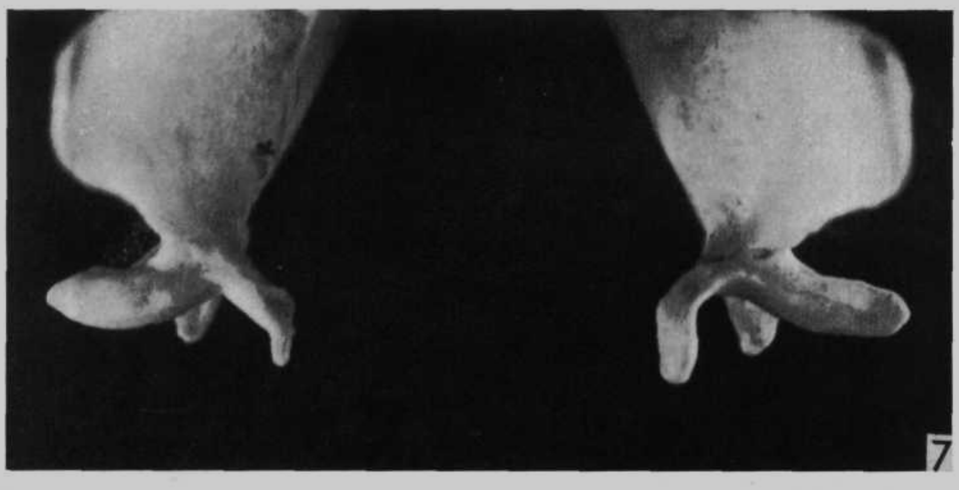

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Fig. 7: *Eira barbara* (L.), skull no. An 23110. Left and right processus articularis mandibulae, vertical view.

Fig. 8: *Eira barbara* (L.), skull no. An 23110. Right and left mandibular joint, basilar view.
(Photographs by the author)

Phot. 2. Dunajec at Tylmanowa. Sector No. 26. Gudgeon appear but are not numerous.

Phot. 1. Dunajec at Jazowsko. Sector No. 28. Gudgeon appear but are not numerous.