CONTRIBUTIONS

The contemporary status of the two Amu Darya River shovelnose sturgeons, *Pseudoscaphirhynchus kaufmanni* and *P. hermanni*

Vladimir B. Salnikov[1], Vadim J. Birstein[2], and Richard L. Mayden[3]

[1]Institute of Zoology, Turkmenian Academy of Sciences, Ashgabad, Turkmenistan
[2]The Sturgeon Society, New York, USA
[3]Department of Biological Sciences, University of Alabama, Tuscaloosa, USA

Introduction

The three Central Asian shovelnose species belonging to the genus *Pseudoscaphirhynchus* are characterized by a unique morphology among sturgeons (Berg, 1905, 1948; Nikolskii, 1938; Oliva, 1958, 1960; Sagitov, 1968; Birstein, 1997) and together with three North American species of the genus *Scaphirhynchus* (Mississippi River and Rio Grande basins), are included in the subfamily Scaphirhynchinae (Mayden and Kuhajda, 1996; Bemis et al., 1997). Historically, two endemic, freshwater species of the genus *Pseudoscaphirhynchus* inhabited the Amu Darya River (Turkmenistan and Uzbekistan, Central Asia): the large Amu-Dar shovelnose sturgeon, *P. kaufmanni* Bogdanov, 1874, and small Amu-Dar shovelnose sturgeon, *P. hermanni* Kessler, 1877 (Berg, 1905; 1948; Nikolskii, 1938; Shaposhnikova, 1950; Tleuov and Sagitov, 1973; Pavlovskaya and Zholdasova, 1991; Birstein, 1997).

Prior to the 1960s, *P. kaufmanni* inhabited the Amu Darya River from its sources to its mouth (Nikolskii, 1973; Tleuov and Sagitov, 1973). This species also lived in small irigation channels connected with the river and in the Karakum Canal system (Salnikov, 1994, 1995). Sturgeons were concentrated mainly in the middle reaches of the Amu Darya River, near the towns of Kerki, Chardzhou and Ildzhik (Zholdasova, 1997).

During the last 30 years, environmental conditions in the area have been dramatically altered with the anthropogenic evaporation of the Aral Sea (Aladin and Potts, 1992; Feshbach and Friendly, 1992). The Amu Darya River, which formerly flowed into the Aral Sea for the last 6,000 years (Kes et al., 1980; Kvasov, 1980), no longer reaches the Aral Sea (Zholdasova, 1997). Between 1989-1991, *P. kaufmanni* have been found mainly in the middle reaches of the river, between Kerki and Chardzhou (Zholdasova, 1997).

Pseudoscaphirhynchus hermanni was initially described as a rare species (Berg, 1905; 1948; Nikolskii, 1938). It has not been found since 1982 and has been regarded as extinct (Pavlov et al., 1985; 1994). Both species, *P. kaufmanni* and *P. hermanni*, are listed as endangered in Uzbek SSR Red Data Book (1983), USSR Red Data Book (1984), and Turkmen SSR Red Data Book (1985). *Pseudoscaphirhynchus kaufmanni* was proposed as Endangered, and *P. hermanni* as Critically Endangered for the 1996 IUCN (The World Conservation Union) Red List of Threatened Animals.

This paper describes the results of two recent expeditions to the Amu Darya River, in February and April 1996. These expeditions were sponsored by The Sturgeon Society (New York, USA) and the National Science Foundation Division of Environmental Biology and International Programs (Washington, USA). The purpose of the expeditions was to evaluate the current conservation status of *P. kaufmanni* and *P. hermanni* in the middle reaches of the river.

Materials and Methods

Time and Location of the Expeditions. The first expedition took place in February, and the second, between 8 and 23 April 1996. Both expeditions occurred in a region of the Amu Darya River near the town of Kerki, between the villages of Tashrabad and Khalch (Turkmenistan; about 100 km along the river).

Nets. Drift nets 65 and 55 m long and 2 m high with a mesh of 38 or 50 mm were used. The construction of the nets permitted the catch of all fishes non-selectively. The depth of the harvest was 0.5-2.5 m from the surface. Nets were set by boat across the river and allowed to drift for 50-150 m along the river. Sturgeons were caught in channels near small sand islands in slower current than in the main riverbed, and over clean sand or sand and clay substrate.

Morphology. Meristic and morphometric characters followed those described in Tleuov and Sagitov (1973). English names of the characters are from Holcik et al. (1989). Morphometric measurements and meristic counts were obtained from the right side of specimens.

Age determination. Age of specimens was estimated by counting annular rings on cross sections of the anterior pectoral fin-rays (Chugunova, 1952).

Results and Discussion

Expedition in February 1996. The objective of this expedition was to determine if any *P. kaufmanni* individuals could be found in the middle reaches of the Amu Darya River in the vicinity of Kerki. During this expedition, a 38 mm-mesh net was used for

Table 1. Size and weight of individuals of *Pseudoscaphirhynchus kaufmanni* captured in the middle reaches of the Amu Darya River near Kerki in February, 1996

Specimen number	*Tl*, mm[1]	*Fl*, mm[2]	*Sl*, mm[3]	*Tfl*, mm[4]	w, g[5]
1	170	150	130	290	15
2	190	165	140	320	23
3	195	170	150	340	23
4	210	190	160	340	27
5	220	195	170	380	30
6	230	210	180	380	37
7	230	200	180	370	42
8	330	300	270	530	125
9	360	320	275	590	172
10	480	430	380	730	430

[1] Total length without the caudal filament.
[2] Fork length.
[3] Standard length from the end of the snout to the last lateral scute.
[4] Total length with the caudal filament.
[5] Weight.

Table 2. Main morphological and biological characteristics of *Pseudoscaphirhynchus kaufmanni* and *P. hermanni* captured in the middle reaches of the Amu Darya River near Kerki in April, 1996[1]

Specimen number	*Tl*, mm	*Fl*,mm	*Sl*,mm	*Tfl*, mm[2]	*w*, g	Age[4]	Sex	Stage of maturity[5]	Coloration
I.a. *Pseudoscaphirhynchus kaufmanni* (normal)									
1	200	185	155	330	24.0	ND[3]	male	ND	light
2	220	193	170	ND	31.0	4	female	II	light
3	245	220	193	ND	50.0	3	female	II	light
4	245	225	195	365	51.0	6	male	III	light
5	273	238	203	460	69.0	ND	male	III	light
6	380	340	295	655	180.0	ND	ND	ND	light
7	385	337	295	ND	136.0	4	male	III	light
8	428	365	325	655	265.0	9	male	IV	light
9	440	385	345	667	360.0	ND	male	IV	light
10	455	408	363	665	357.0	7	female	II	light
11	465	410	365	790	351.0	ND	male	IV	light
12	473	422	375	717	326.0	4	male	IV	light
13	480	428	385	745	382.0	ND	male	IV	light
14	495	442	395	767	492.0	8	male	IV	light
15	550	492	442	855	544.0	12	female	II	light
16	555	490	450	770	625.0	10	male	IV-V	light
I.b. *P. kaufmanni* (dwarf)									
17	112	100	85	165	3.5	ND	ND	ND	dark
18	210	180	154	365	26.5	5	female	II	dark
19	215	198	173	393	28.0	4	male	III	dark
20	225	200	173	390	35.0	5	female	II	dark
21	226	205	173	406	34.0	4	female	II	dark
22	227	197	172	367	35.0	5	female	II	dark
II. *P. hermanni*									
1	275	257	223	-	50.5	5	female	II	light
2	230	213	188	-	33.0	6	female	II	dark
3	212	195	173	-	25.0	ND	ND	ND	dark

[1] Main symbols (*Tl*, *Fl*, *Sl*, *Tfl*, *w*) are the same as in Table 1.
[2] Caudal filament is present only in *P. kaufmanni*.
[3] ND, not determined.
[4] Determined by Dr. Georgii Ruban, Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Moscow, Russia.
[5] Stages according to Nedoshivin (1928).

catching sturgeons. Eight sets were made and 10 individuals of *P. kaufmanni* were caught (Table 1). These fish were, on the whole, larger than those caught between 1989-1991 in the Amu Darya River between Chardzhou and Kerki. The total length (*Tl*, without a filament) of those fish was from 93 to 380 mm (Zholdasova, 1997). Following weighing and recording measurements, all sturgeon were released.

Expedition in April 1996. The objective of this expedition was to make a more detailed evaluation of the population and conservation status of *P. kaufmanni* during its spawning period (March-April; Tleuov and Sagitov, 1973) and attempt to catch *P. hermanni*. During this expedition, 107 sets were made. In 20 sets 50 mm-mesh nets were used, and in 87 sets, 38 mm-mesh nets were used. Water temperature increased from 13 °C to 21 °C between 8 and 23 April during the expedition.

1. *Pseudoscaphirhynchus kaufmanni*. During this period 121 *P. kaufmanni* individuals were caught. The catch reached 10 sturgeons per catch effort per net and 50 individuals per day. This is comparable to results from the late 1960s-early 1970s when 6-8 individuals per catch effort per net was observed during the spawning period of *P. kaufmanni* in March-April (Tleuov and Sagitov, 1973). In the area of the Amu Darya River studied, *P. kaufmanni* were rather numerous, at least during the spawning period. Twenty-two of the 121 specimens captured were retained for additional study; the other individuals were released. Morphological and biological characteristics of these 22 specimens are provided in Table 2.

All 22 specimens were sorted according to size and coloration (Table 2). According to Sagitov (1969) and Tleuov and Sagitov (1973), dark colored individuals of *P. kaufmanni* represent a

Table 3. Comparison of size, weight and age of the dwarf form of *P. kaufmanni* captured in the late 1960s-early 1970s with those captured in 1996

	Males			Females		
	Tl, mm	w, g	Age, years	*Tl*, mm	w, g	Age, years
Late 1960s-early 1970s[1]	240-303	39.3-78.7	5-7	230-315	40.9-70.5	6-8
April 1996[2]	215	28.0	4	210-227	26.5-35.0	4-5

[1] Data from Tleuov and Sagitov (1973).
[2] This study.

dwarf form of this species. Of the 22 specimens retained, 16 specimens were the normal form and 6 specimens were the dwarf form (Table 2). Age was determined in 10 normal and 5 dwarf individuals; sex was determined in 14 normal and 5 dwarf individuals.

The size, weight, and age of the males and females of the normal form were approximately the same: *males* - *Tl*=200-555 mm, w=24-625 g, 4-10 years, and *females* - *Tl*=220-550 mm, w=31-220 g, 3-12 years. All specimens of the normal form studied were mature adults at stages II (females) and III-V (males) of maturity (Table 2). In previous studies it has been shown that males and females of the normal form mature at 6-7 or 7-8 years of age, resprctively, and at *Tl*<400 mm (Nikolskii, 1938; Tleuov and Sagitov, 1973). The size, weight, and age of the mature adults observed in our study are lower than those observed in the late 1960s-early 1970s (Table 3). It is possible that with the new environmental conditions in the area *P. kaufmanni* matures earlier than previously documented.

2. *Pseudoscaphirhynchus hermanni*. Three specimens of *P. hermanni* (Table 2) were caught in the Amu Darya River for the first time since the early 1980s (Pavlov et al., 1985). These specimens[1] are larger than those of the same age (4-5 years old) described in Tleuov and Sagitov (1973). Our specimens were of 212-275 mm *Tl* and 25.0-50.5 g, while those described in Tleuov and Sagitov (1973) were of 188-207 mm *Tl* and 12.7-17.2 g. Morphometric and meristic characters for two of the three specimens are provided in Table 4. All measurements for morphometric characters (in % of fork length, *Fl*) and counts for meristic characters were within the limits provided by Tleuov and Sagitov (1973) for this species.

The largest specimen (No. 1 in Tables 2 and 4) is the largest known specimen for the species: the largest specimen listed in Nikolskii (1938) was 210 mm *Sl*, while our specimen No.1 was 233 mm *Sl*. This specimen also differs from two other specimens (Nos. 2 and 3, Table 2) by its color (light versus the two others were dark) and the morphology of the snout. The snout of specimen No. 1 was relatively longer than that of specimen No. 2 (snout length, *prO*, was 26 and 23% of the fork length, respectively; Table 4). Other morphological differences exist between specimens Nos. 1 and 2: all fins of specimen No. 1 are shorter than in No. 2 (see *hD* and *hA*, Table 4), and ventral and anal fins are located closer to the tail in No. 1 than in No. 2 (see *pV* and *pA* in Table 4). It is possible that there are two morphs within this species as previously observed within *P. kaufmanni*. Current taxonomic studies by Mayden, Kuhajda, and Birstein on *Pseudoscaphirhynchus* should provide conclusive evidence regarding the taxonomy of this species.

[1] Specimens of *P. hermanni* are deposited at the Institute of Zoology, Turkmenian Academy of Sciences, Ashgabad, Turkmenistan.

Conclusions

1. *Pseudoscaphirhynchus kaufmanni* is rather numerous in the middle reaches of the Amu Darya River, in an area between Tashrabad and Khalch, Turkmenistan.

2. The population of *P. kaufmanni* in the area studied consists of two morphs, normal and dwarf. These morphs differ in age, color, and morphological characters. The normal male had a maximum size (*Tl*) of 555 mm (or 770 mm with the caudal filament), weighed 625 g, and was 10 years of age. The nomral female had a maximum size (*Tl*) of 550 mm (or 855 mm with the caudal filament), weighed 855 g, and was 12 years of age. The size of the only dwarf male caught was 198 mm (or 215 mm with the caudal filament), weighed 28.0 g, and was 4 years of age. The dwarf females were 210-227 mm (or 365-406 mm), weighed 26.5-35.0 g, and were 4-5 years of age.

3. Three individuals of *P. hermanni* were caught for the first time since 1983. This species is thus not extinct but should be considered extremely rare.

4. The size of the largest female of *P. hermanni* captured during this study is the maximum known for the species: total length 275 mm, weight 50.5 g.

5. There are possibly two morphs within *P. hermanni* (as within *P. kaufmanni*): a lightly colored morph with a long snout, and a dark morph with a short snout.

6. Elucidation of the taxonomic status of the various morphs within *P. kaufmanni* and *P. hermanni* will be critical to any success at conservation and management of these species.

Acknowledgments

The authors thank *The Sturgeon Society* (New York) and the National Science Foundation (grant DEB-9527938) for financial support of this research. We also wish to express our gratitude to Dr. Georgii Ruban (Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Moscow, Russia) for age determination of both species of *Pseudoscaphirhynchus*.

References

Aladin, N. V., and W. T. Potts. 1992. Changes in the Aral Sea ecosystem during the period 1960-1990. Hydrobiologia 237: 67-79.

Bemis, W. E., E. K. Findeis, and L. Grande. 1997. An overview of Acipenseriformes. Env. Biol. Fish. 48 (in press).

Berg, L. S. 1905. Fishes of Turkestan. Scientific Results of the Aral Expedition, No. 6. St. Petersburg. 261 pp. (in Russian).

Berg, L. S. 1948. The Freshwater Fishes of the USSR and Adjacent Countries, Vol. 1. Akademia Nauk USSR, Moscow & Leningrad. Part 1. (in Russian; English translation published by Israel Program for Scientific Translations, Jerusalem. 505 pp.)

Birstein, V. J. 1997. Threatened fishes of the world: *Pseudoscaphirhynchus* spp. (Acipenseridae). Env. Biol. Fish. 48 (in press).

Bogdanov, M. 1874. A report on a newly discovered acipenserid fish at the meeting of Zoological Section. Trudy Sankt-Peterburgskogo Obshchestva Ispytatelei Prirody 5: 48 (in Russian).

Chugunova, N. I. 1952. Methods of Fish Age and Growth Studies. Sovetskaya Nauka, Moscow. 118 pp. (in Russian).

Feshbach, M. & A. Friendly, Jr. 1992. Ecocide in the USSR. Health and Nature Under Siege. Basic Books, New York. 376 pp.

Holcik, J., P. Banarescu, and D. Evans. 1989. A. General introduction to fishes. In: Holcik, J. (ed.) The Freshwater Fishes of Europe, Vol. 1, Pt. II, General Introduction to Fishes, Acipenseriformes, AULA-Verlag, Wiesbaden. Pp. 18-147.

Kes, A. S., B. V. Andrianov, and M. A. Itina. 1980. Dynamics of the hydrographic net and changes in the Aral Sea levels. In: Changes in the Humidity of the Aralo-Caspian Region in the Holocene. Nauka Publ., Moscow. Pp. 181-185 (in Russian).

Kessler, K. F. 1877. Fishes of the Aralo-Caspian-Pontine Region. Trudy Aralo-Kaspiiskoi Ekspeditsii 4: 190-196 (in Russian).

Kvasov, D. D. 1980. Paleolimnology of the Aral Sea. In: Changes in the Humidity of the Aralo-Caspian Region in the Holocene. Nauka Publ., Moscow. Pp. 160-172 (in Russian).

Mayden, R. L., and B. R. Kuhajda. 1996. Systematics, taxonomy, and conservation status of the endangered Alabama sturgeon,

Table 4. Morphometric and meristic characters of two individuals of *Pseudoscaphirhynchus hermanni* captured in the Amu Darya River in April, 1996

Character[1]	Specimen No. 1[2]		Specimen No 2[2]	
1. *Morphometric characters*	mm	% of *Fl*	mm	% of *Fl*
Fork length, *Fl*	257	-	213	-
Total length, *Tl*	275	107.0	230	108.0
Standard length, *Sl*	233	90.7	188	88.3
Length of the head, *lc*	96	37.3	76	35.7
Preorbital distance (snout length), *prO*	67	26.1	49	23.0
Width of snouth at the level of mouth	33	12.8	30	14.1
Width of snout at base of barbles, *lab*	32	12.5	27	12.7
Distance between tip of snouth and base of middle barbles, *s-b*	53	20.6	38	17.8
Distance between tip of snout and cartilaginous arch of mouth, *s-mc*	67	26.1	50	23.5
Distance between base of middle barbles and cartilaginous arch of mouth, *b-mc*	15	5.8	12	5.6
Width of mouth, *lam*	21	8.2	20	9.4
Length of the largest barbel, *ldb*	26	10.1	26	12.2
Horizontal diameter of eye, *Oh*	3	0.1	1	0.5
Interorbit distance, *io*	20	7.8	26	12.2
Head depth at nape, *hc*	17	6.6	17	8.0
Head depth at eye level, *hco*	13	5.0	12	5.6
Maximal body depth, H	23	8.9	21	9.8
Minimal body depth, h	6	2.3	4	1.9
Body width, *laco*	22	8.6	21	9.9
Length of caudal peduncle, *lpc*	43	16.7	40	18.8
Predorsal distance, *pD*	188	73.1	148	69.5
Preventral distance, *pV*	164	63.8	131	61.5
Preanal distance, *pA*	196	76.3	160	75.1
Length of dorsal fin, *lD*	20	7.8	20	9.4
Depth of dorsal fin, *hD*	11	4.3	11	5.2
Length of anal fin, *lA*	8	3.1	10	4.7
Depth of anal fin, *hA*	18	7.0	17	8.0
Length of pectoral fin, *lP*	17	6.6	16	7.5
Length of ventral fin, *lV*	11	4.3	13	6.1
Distance between pectoral fin base and ventral fin base, *P-V*	76	29.6	62	29.1
Distance between ventral fin base and anal fin base, *V-A*	32	12.4	32	15.0
2. Meristic characters				
Number of rays in dorsal fin, *Db*	27		28	
Number of rays in anal fin, *Ab*	18		18	
Number of lateral scutes, *SL*	37		36	
Number of ventral scutes, *SV*	8		7	
Number of gill rakers, *Sp. br.*	12		13	

[1] Mainly standardized according to Holcik et al. (1989)
[2] The same specimens as in Table 2.

Scaphirhynchus suttkusi Williams and Clemmer (Actinopterygii, Acipenseridae). Copeia 1996(2) :241-273.

Nedoshivin, A. Ya. 1928. Materials on the Don River fishery. Trudy Azovo-Chernomorskoi Nauchno-Promyslovoi Ekspeditsii No. 4 :1-175 (in Russian).

Nikolskii, G. V. 1938. Fishes of Tadjikistan. Izdatelstvo Akademii Nauk USSR, Moscow-Leningrad. 228 pp. (in Russian).

Oliva, O 1958. A note on *Pseudoscaphirhynchus kaufmanni* (Bogdanow) (Osteichthyes, Acipenseridae). Acta Soc. Zool. Bohem. 22 :6-9.

Oliva, O. 1960. A further note on *Pseudoscaphirhynchus kaufmanni* (Bogdanow) (Osteichthyes: Acipenseridae). Acta Univ. Carol., Biol. No. 1 :35-36.

Pavlov, D. S., Yu. S. Reshetnikov, M. I. Shatunovsky, and N. I. Shilin. 1985. Rare and endangered fish species of the USSR and principles for listing them in the Red Data Book. Voprosy Ikhtiologii 25: 16-25 (in Russian, English translation: J. Ichthyol. 25: 88-99).

Pavlov, D.S., K. A. Savvaitova, L.I. Sokolov, and S.S. Alekseev. 1994. Rare and Endangered Animals, Fishes. Vysshaya Shkola, Moscow. 334 pp. (in Russian).

Pavlovskaya, L. P., and I. M. Zholdasova. 1991. Anthropogenic changes in the fish fauna of the Amu Darya River (based on data from sampling drift of eggs and larvae). Voprosy Ikhtiologii 31: 585-595 (in Russian, English translation: J. Ichthyol. 31: 106-117).

Sagitov, N. I. 1968. On the morphology of the large Amu-Dar shovelnose sturgeon [*Pseudoscaphirhynchus kaufmanni* (Bogd.)]. Voprosy Ikhtiologii 8(5) :809-816 (in Russian).

Sagitov, N. I. 1969. On the dwarf morph of the large Amu-Dar shovelnose sturgeon. Nauchnye Doklady Vysshei Shkoly, Seriya Biologicheskikh Nauk, No. 6 (in Russian).

Salnikov, V. B. 1994. Formation of the fish population in the artificial hydrographic network of Turkmenistan (the Amu Darya River). In: Fet, V. and K. I. Atamuradov (eds.) Biogeography and Ecology of Turkmenistan. Kluwer Acad. Publ., Dordrecht. Pp. 365-387.

Salnikov, V. B. 1995. Possible changes in the ichthyofauna after a completion of the construction of the Karakum Canal in Turkmenistan. Voprosy Ikhtiologii 35(3):365-373 (in Russian, English translation: J. Ichthyol. 35(7) :108-121).

Shaposhnikova, G. Kh. 1950. Fishes of the Amu Darya River. Trudy Zoologicheskogo Instituta 9 (1):16-54 (in Russian).

Tleuov, R. T. and N. I. Sagitov. 1973. Acipenserid fishes of the Aral Sea. FAN Press, Tashkent. 155 pp. (in Russian).

Turkmen SSR Red Data Book. 1985. Ashgabad (in Russian).

USSR Red Data Book. 1984. Part 1. Lesnaya Promyshlennost, Moscow. 390 pp. (in Russian).

Uzbek SSR Red Data Book. 1983. Vol. 1. Vertebrates. FAN Press, Tashkent. 127 pp. (in Russian).

Zholdasova, I. 1997. Sturgeons and the Aral Sea ecological catastrophe. Env. Biol. Fish. 48 (in press).

Karyological study of the stellate sturgeon, *Acipenser stellatus*, from the Danube River

Radu Suciu and Cristina Ene

Sturgeon Research Group, Danube Delta Institute
Str. Babadag 165, 8800 Tulcea, Romania

The presence of a high number of very small microchromosomes is one of the most unusual characters of sturgeon karyotypes (Birstein et al., 1997). This special feature makes it difficult to study the sturgeon karyology (Fontana and Colombo, 1974; Arefjev, 1983; Rab, 1986; Fontana, 1994). Until now, karyotypes of eight European sturgeon species were described (review in Birstein et al., 1997). Of the four sturgeon species (*Acipenser gueldenstaedti, A. ruthenus, A. stellatus*, and *Huso huso*) now existing in the lower reaches of the Danube River (Banarescu, 1994), only the karyotype of the Danubian sterlet, *A. ruthenus*, was studied until now (Rab, 1986). In this paper a karyotype of the stellate sturgeon, *A. stellatus*, from the Danube River basin is described. Previously the karyotype of this species was studied only in individuals from the Volga River population (Birstein and Vasiliev, 1987).

Materials and Methods

Sturgeons. Three young-of-the-year stellate sturgeons were caught in net traps installed in the Black Sea near the shore to the north from the mouth of the St. George branch of the Danube River, at the town of Buival, in September 1995.

Preparation of chromosome slides and chromosome staining. Chromosome slides were prepared from the kidneys of colchicinized sturgeons according to a standard method (Foresti et al., 1992). Cells were hypotonized in 0.075 M KCl for 25 min. Giemsa staining and AgAS-staining were also performed using standard methods (Fontana, 1994).

Results

The karyotype of *A. stellatus* from the Danube River basin consists of 118 ± 2 chromosomes, NF = 186 ± 2, and includes a high number of microchromosomes (Fig. 1). There are from three to four NOR-bearing chromosomes per karyotype (a pair of macrochromosomes and a pair of small chromosomes). NORs are located in the telomeric region of long arms of these chromosomes. (Fig. 2) Our results confirm the data on the karyotype of *A. stellatus* from the Volga River (Birstein and Vasiliev, 1987). The presence of two pairs of NOR-bearing chromosomes supports the hypothesis of the tetraploid origin of sturgeons (Dingerkus and Howell, 1976; Birstein et al., 1997).

References

Arefjev, V. A. 1983. Polykaryographic analysis of ship sturgeon, *Acipenser nudiventris* Lovetsky (Acipenseridae, Chondrostei). Voprosy

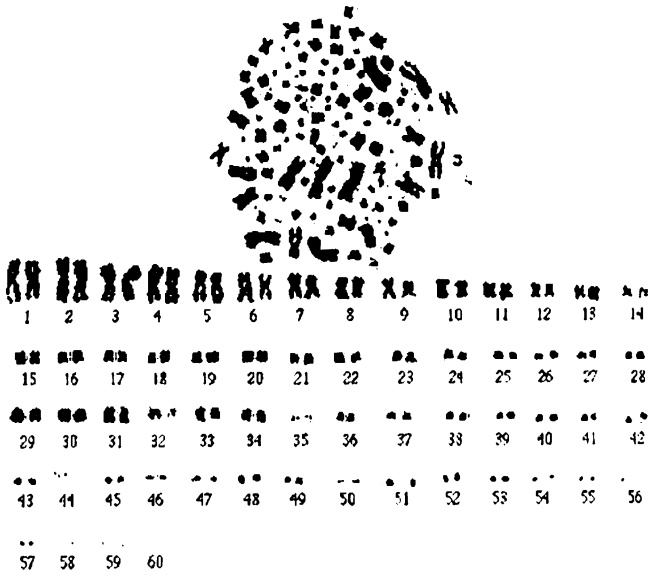

Fig 1. Metaphase and a karyotype of the stellate sturgeon, Acipenser stellatus, from the Danube River basin. 2n=120, NF=186.