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On the Taxonomic Status of *Leuciscus sachalinensis* Nikolsky, 1889 (Cypriniformes, Cyprinidae)

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Abstract—Comparative morphological analysis of syntypes of *Leuciscus sachalinensis* Nikolsky, 1889 and of materials on different species of the genus *Tribolodon* revealed that *L. sachalinensis* is an senior synonym for *Tribolodon hakuensis ezoe* Okada et Ikeda, 1937. In connection with this, the lectotype of *L. sachalensis* is designated, its status is resurcected, and the species is named *Tribolodon sachalensis* (Nikolsky, 1889), comb. n. as senior valid name. The established synonymy, clarified diagnosis, differences from closely related species, and data on the distribution of *T. sachalinensis* are provided.

In 1889, Nikolsky described a new species—Sakhalin "roach" *Leuciscus sachalinensis* from three specimens of fish collected by Polyakov in the western part of Sakhalin (Nikolsky, 1889: 296–298). Among characteristics distinguishing *L. sachalinensis* from *L. hakuensis* Günther, 1880 and *L. taczanowskii* Steindachner, 1881 that were described earlier and are more closely related to it, Nikolsky indicated a wider forehead (interorbital space is less than three times in the head length) and longer ventral fins extending to the anal opening. In addition, differences in these species in body thickness, caudal peduncle depth, number of scale rows between the lateral line and the origin of ventral fins, and in other characters were emphasized. Of specific biological features, it was noted that this species "lives the whole year round in rivers," in their lower reaches with a weak flow.

Having studied the type material of *L. sachalinensis*, Shmidt acknowledged the reality of the new species and included it in the review of fish of eastern seas of Russia (1904).

In his report on fish of the Amur, Berg (1909) listed *L. sachalinensis* among ten small-scaled (squamulose) species of the genus *Leuciscus* that were decribed by that time from the basin of the Sea of Japan and the adjacent areas, but restrained from any definite opinion with respect to the taxonomic relationships of these species.

Later, Berg analyzed the accessible material and concluded that in the Russian part of Eastern Asia there are only two small-scaled species of *Leuciscus* with an asymmetrical formula of pharyngeal teeth (2.5–4.2)—*L. brandtii* (Dybowski, 1872) and *L. hakuensis* (Berg, 1912: 96). In his opinion, *L. sachalinensis*, as well as several other species described from the region at the end of the 19th century (*L. taczanowskii* Steindachner, 1881; *L. adele* Warpachowski, 1892; *L. ledae* Warpachowski, 1892; *L. warpachowskii* Schmidt, 1904), are synonyms of *L. brandtii* (Berg, 1912: 152–159).

Among Russian ichthyologists, this point of view dominated up to the beginning of the 1970s when Gritsenko (1972, 1974) clearly demonstrated the presence on Sakhalin of three species of Eastern redfins[1] considered at the present time in the composition of a separate genus *Tribolodon* Sauvage, 1883–*T. brandtii* (Dybowski, 1872), *T. hakuensis* (Günther, 1880), and *T. ezoe* Okada et Ikeda, 1937. The latter of these three species was initially described as a subspecies *T. hakuensis ezoe* based on the biometric study of redfins from Hokkaido Island (Okada and Ikeda, 1937). Note that the type specimens of this taxon have not been found (Eschmeyer, 1998) and were evidently lost.

This paper provides results of the comparative analysis of syntypes of *Leuciscus sachalinensis* that indicated that this name is an senior synonym for *Tribolodon hakuensis ezoe* and a brief description of the species with consideration of new data.

MATERIAL AND METHODS

The external morphology was studied in a total of 102 individuals of different species of the genus *Tribolodon* including three syntypes of *L. sachalinensis* (characteristics of the samples are presented below). Characters commonly used in the genus taxonomy were used: structure of lateral-line head canals (Nakamura, 1963; Onodera and Honma, 1976; Kurawaka,

[1] The presence of three forms of redfin on Sakhalin (*Tribolodon taczanowskii*, *T. hakuensis hakuensis*, *T. hakuensis ezoe*) was earlier noted by Ikeda (Ikeda, 1938, cited after Sato, 1942).

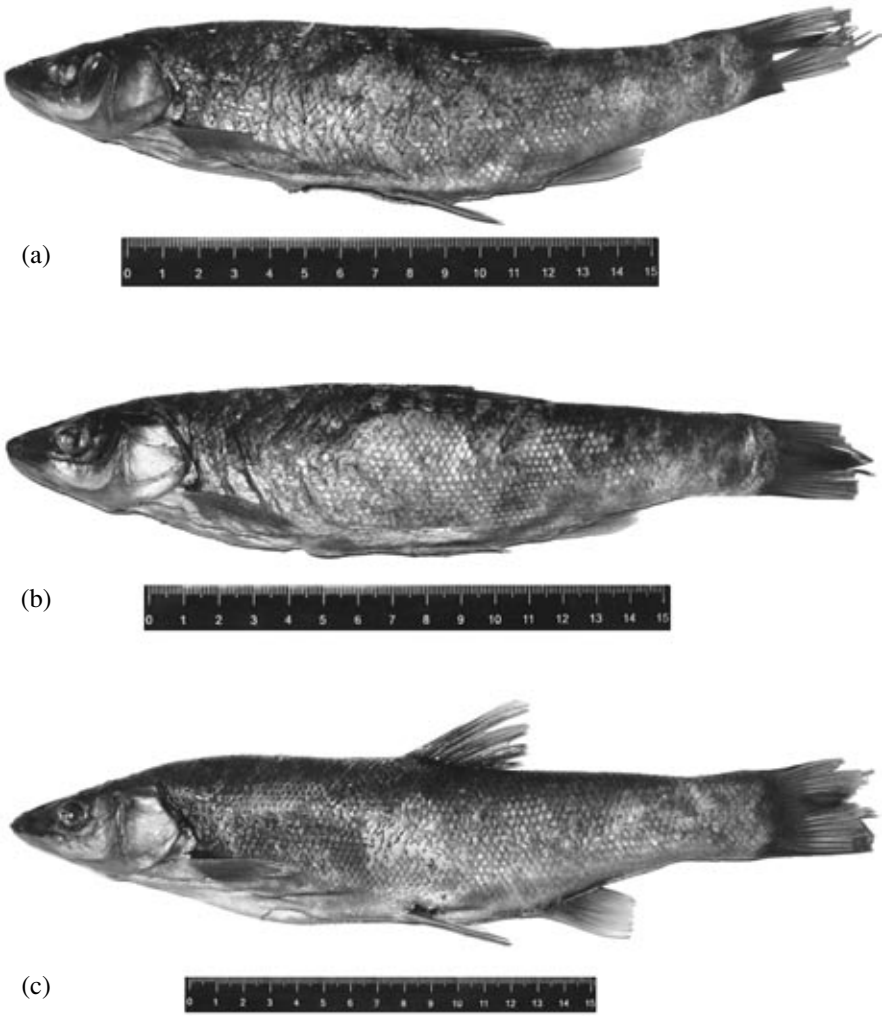

Fig. 1. General view of the type material of *Leuciscus sachalinensis*: (a) lectotype ZIN no 6598; (b, c) paralectotypes ZIN no. 6599.

1977; Bogutskaya, 1988; Sakai, 1995; Sviridov and Ivankov, 2002), shape of the swimming bladder (Kahata, 1981; Churikov and Sabitov, 1982), specific features of the scale cover (Okada and Ikeda, 1937; Okada, 1961; Nakamura, 1963; Gritsenko, 1972, 1974; Onodera and Honma, 1976; Gavrenkov and Ivankov, 1979; Sakai and Hamada, 1985; Hosoya, 1993), spawning coloration (Nakamura, 1963; Gritsenko, 1974; Gavrenkov and Ivankov, 1979; Hosoya, 1993; Sakai, 1995; Sviridov *et al.*, 2002), position of jaws (Nakamura, 1963; Onodera and Honma, 1976; Hosoya, 1993; Doi and Shinzawa, 2000), as well as some morphometric indices (Gritsenko, 1974; Gavrenkov and Ivankov, 1979).

RESULTS AND DISCUSSION

According to characters that can be studied on the fixed material, the type specimens of *L. sachalinensis* Nikolsky fully correspond to the diagnostic characteristics of *T. ezoe*: inferior mouth position (Fig. 1); suprapraeoperculum absent; canalis praeoperculo-mandibularis (CPM) of the seismosensory system of the head is not connected with canalis temporalis (CT)[2]; posterior part of the canalis supraorbitalis (CSO) is situated within parietale with 1–2 pores (as a variation, in each specimen in the sample (ZIN no. 6599) on one of the parietalia, the canal is partially open on the top and looks like a deep trough); posterior end of the swimming bladder is rounded (Fig. 2); lateral-line scales 78–79; predorsal scales 42–46; gill rakers 12–13; ventroanal distance small (18.1–19.2% of the body length to the end of scale cover); ventral fin length is 77.5–83.3% of this distance (table). In connection, we consider that *L. sachalinensis* and *T. hakuensis ezoe* are synonyms and by the principle of priority (Article 23.1. of the International Code of Zoological Nomenclature, 2004),

[2] In papers of Japanese authors, this region of head canals of the seismosensory system is named postocular commissure (POC).

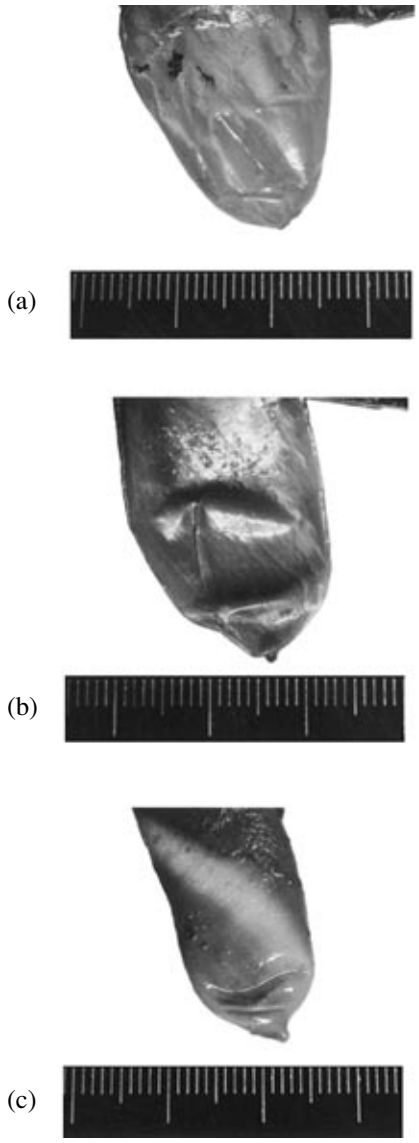

Fig. 2. Form of the posterior end of the swimming bladder of *Leuciscus sachalinensis*: (a) lectotype ZIN no. 6598; (b, c) paralectotypes ZIN no. 6599.

the name *Tribolodon sachalinensis* (Nikolsky, 1889) should be used to this species.

Below, we cite the synonymy that we established for the given species, a diagnosis made on the basis of our and published data (Okada and Ikeda, 1937; Nakamura, 1963; Gritsenko, 1972, 1974, 2002; Onodera and Honma, 1976; Kurawaka, 1977; Gavrenkov and Ivankov, 1979; Kahata, 1981; Churikov and Sabitov, 1982; Sakai and Hamada, 1985; Bogutskaya, 1988; Hosoua, 1993; Sakai, 1995; Doi and Shinzawa, 2000; Sviridov and Ivankov, 2002), as well as comparative remarks that include its differences from other closely related species and data on the variation of the spawning color and distribution.

***Tribolodon sachalinensis* (Nikolsky, 1889),**
comb. n. et stat. resurr.

Leuciscus sachalinensis Nikolsky, 1889: 296 (the Bol'shaya Aleksandrovka River near the city of Aleksandrovsk-Sakhalinskii, Sakhalin Island, Russia).

Leuciscus sachalinensis—Schmidt, 1904: 254; Berg, 1909: 106.

Leuciscus brandti (sic!)–Berg, 1912: 152 (part): Sato, 1942: 107 (part); Berg, 1949: 569 (part); Lindberg and Legeza, 1965: 154 (part); Gavrenkov and Ivankov, 1979: 1020 (part).

Tribolodon hakuensis ezoe Okada et Ikeda, 1937: 161 (Hokkaido Island, Japan), syn. n.

Tribolodon hakuensis ezoe—Sato, 1942: 106; Okada, 1961: 482.

Tribolodon ezoe—Nakamura, 1963: 127; Gritsenko, 1972: 391: Gritsenko, 1974: 794; Kurawaka, 1977: 168; Kahata, 1981: 349; Chyrikov and Sabitov, 1982: 882; Sakai and Hamada, 1985: 216; Hosoya, 1993: 224; Sakai, 1995: 2; Bogutskaya, 1998: 72; Sakai, 2000: 25; Doi and Shinzawa, 2000: 241; Ivanov and Ivanova, 2001: 253; Bogutskaua *et al.*, 2001: 43; Pietsch *et al.*, 2001: 140; Gritsenko, 2002: 186; Kolpakov and Kolpakov, 2002: 840; Sviridov and Ivankov, 2002: 418; Sviridov *et al.*, 2002: 558; Shedko, 2002: 119; Sakai *et al.*, 2002: 1293; Kolpakov and Kolpakov, 2003: 740; Reshetnikov *et al.*, 2003: 337; Safronov and Nikiforov, 2003: 46; Bogutskaya and Naseka, 2004: 97.

Leuciscus ezoe—Onodera and Honma, 1976: 65.

Type material. Lectotype (the smallest of three syntypes with body length up to caudal fin ray origin, SL, 215 mm, female) is designated here for the sake of stability of nomenclature; the original label is "*Leuciscus sachalinensis* Nikolski, Alexandrowsk, Poljakov 1883"; it is kept in the collection of the Zoological Institute of the Russian Academy of Sciences (ZIN RAN, St. Petersburg)—no. 6598. Paralectotypes are two other (SL 222 and 273 mm; female and male, respectively) syntypes of *L. sachalinensis* with the same characteristics; they are kept in ZIN RAN—no. 6599.

Additional material. Sakhalin Island: the Leonidovka River, basin of the Poronai River, Aug 9, 2001 (collector M.B. Shedko)—6 specimens (SL 142–248 mm); the Malyi Takoi River, basin of the Naiba River, July 20, 2001 (M.B. Shedko)—25 specimens (SL 115–239 mm); the Lyutoga River, July 27, 2001 (M.B. Shedko)—2 specimens (SL 172–187 mm); Continental coast of the Sea of Japan: the Koppi River, June 2000 (M.B. Skopets)—6 specimens (SL 92–112 mm). The material is kept in the collection of the Biological–Soil Institute, Far Eastern Division, Russian Academy of Sciences, Vladivostok.

Diagnosis. A species of the genus *Tribolodon* characterized by the following characters: inferior mouth; CPM and CT of the seismosensory system disconnected; supraoperculum absent; posterior part of CSO

Some morphometric characters of the type material of *Leuciscus sachalinensis*

Characters	Lectotype ZIN no. 6598	Paralectotypes ZIN no. 6599	
Body length without caudal peduncle, mm (Nikolsky, 1889: 296)	213	223	275
Body length without caudal peduncle, mm (Schmidt, 1904: 255)	215	223	277
Body length up to caudal-fin ray insertion (SL), mm	215	222	273
Body length up to the end of the scale cover, mm	221	229	279
In % of body length to the end of scale cover			
Snout length	7.8	7.9	8.2
Horizontal eye diameter	3.7	3.9	3.4
Postorbital head region	12.7	12.6	12.2
Head length	24.0	24.0	23.6
Head depth at the occiput	13.5	14.3	13.4
Forehead width	8.0	7.9	7.7
Antedorsal distance	49.8	50.7	52.3
Maximum body depth	23.1	23.4	23.4
Minimal body depth	11.1	10.9	11.4
Caudal peduncle length	21.4	20.6	22.5
Pectoral fin length	16.9	15.7	15.6
Ventral fin length	16.0	14.1	14.9
Dorsal fin insertion length	10.7	9.6	9.2
Dorsal fin depth	19.0	–	18.2
Anal fin insertion length	10.3	9.9	9.4
Anal fin depth	13.8	12.0	12.9
Pectroventral distance	28.9	29.2	27.9
Ventroanal distance	19.2	18.2	18.1
Meristic characters			
Formula of pharyngeal teeth (Schmidt, 1904: 255)	2.5–4.2	2.5–4.2	1.4–4.1
Number of gill rakers	12	13	12
Number of predorsal scales[1]	43	42	46
Number of lateral-line scales (Schmidt, 1904: 255)	79	79	78
Number of dorsal-fin rays	III 7	III 7	III 7
Number of pectoral-fin rays	I 18	I 17	I 16
Number of ventral-fin rays	II 8	II 8	II 8
Number of anal-fin rays	II 9	II 9	III 8

Note: [1] is number of scales along the median line from the occiput to the origin of the dorsal fin insertion (this and all other characters were assessed according to Hubbs and Lagler, 1958).

is within parietale; posterior part of the swimming bladder rounded; 64–84 scales in the lateral line; predorsal scales usually more than 39, on average, according to our data, 43.8 ± 2.3 (40–49); 10–16 gill rakers on the first gill arch; ventroanal distance short, comprising 14–23% of the body length up to the end of scale cover, comparatively long ventral fins usually cover over 75% of this distance.

Comparative remarks. *T. sachalinensis* differs from *T. nakamurai* Doi et Shinzawa, 2000 in the inferior position of the mouth; *T. nakamurai* has a terminal mouth and the lower jaw is slightly protruded anteriorly to the upper jaw. In addition, in *T. nakamurai* there are more scales in the lateral line (86–96) and at the same time fewer gill rakers (9–10) (Nakamura, 1963; Onodera and Honma, 1976; Hosoya, 1993; Doi and Shinzawa, 2000).

T. sachalinensis differs from *T. brandtii* in the absence of a connection between CPM and CT of the seismosensory system, as well as in the complete absence of a supraoperculum (Nakamura, 1963; Onodera and Honma, 1976; Kurawaka, 1977; Boguts-

kaya, 1988; Hosoya, 1993; Sakai, 1995; Sviridov and Ivankov, 2002; our observations). In addition, the posterior end of the swimming bladder is rounded, whereas in *T. brandtii* it is pointed (Kahata, 1981, 1981; Churikov and Sabitov, 1982; our observations). Besides, *T. brandtii* has more scales in the lateral line—73–97 (Nakamura, 1963; Gritsenko, 1972, 1974, 2002; Onodera and Honma, 1976; Gavrenkov and Ivankov, 1979; Sakai and Hamada, 1985; Hosoya, 1993).

T. sachalinensis differs from *T. hakuensis* in a rounded rather than pointed posterior end of the swimming bladder (Kahata, 1981; Churikov and Sabitov, 1982; our observations). The number of predorsal scales in *T. hakuensis* is smaller: 25–39 (Okada and Ikeda, 1937; Okada, 1961; Onodera and Honma, 1976; Sakai and Hamada, 1985), on average, according to our data,[3]—35.2 ± 1.5 (32–38). In addition, CSO of the seismosensory system in *T. hakuensis* terminates at the boundary between frontale and parietale or in the skin integument over parietale (Bogutskaya, 1988; Sviridov and Ivankov, 2002; our observations), ventroanal distance in it is greater (18–25% of the body length up to the end of the scale cover), and ventral fins cover, on average, 64–68% of this distance (calculated according to data: Gritsenko, 1974; Gavrenkov and Ivankov, 1979).

Variation of the spawning color. Elements of nuptial dress in different parts of the range of *T. sachalinensis* are most likely different. The bottom red (or orange) band beginning under the eye and running over the gill cover terminates precisely there in individuals of Japanese populations (Hosoya, 1993: 224; Sakai, 1995: Fig. 1), and in individuals from water bodies of Sakhalin and the Tumnin River, it extends far over the body, reaching the caudal peduncle (Gritsenko, 1974; Sviridov *et al.*, 2002). The genetic homogeneity of *T. sachalinensis* (=*T. ezoe*) from different areas (the continental coast of Tatar Strait, south of Sakhalin, Hokkaido and Honshu islands) has been recently confirmed (Sakai, 2000; Sakai *et al.*, 2002), which, in combination with other diagnostic morphological characteristics, enables us to relate the variation mentioned to the rank of the intraspecific geographic variation.

Distribution. Sakhalin: occurs uniformly in rivers and some lakes in the south of the island (Gritsenko, 1972, 1974, 2002); to the north along the western coast up to the Bol'shaya Aleksandrovka River (present communication); along the eastern coast, up to the Tym' River (Gritsenko, 1972, 1974; Churikov and Sabitov, 1982); there is also an indication that this species is present in the northwestern part of the island (Ivanov and Ivanova, 2001). The continental coast of the Sea of Japan: rivers Tumnin (Sakai, 2000; Sakai *et al.*, 2002; Sviridov *et al.*, 2002), Koppi (present communication), Zheltaya, Samarga, Edinka, and Venyukovka (Kolpakov and Kolpakov, 2003). The Kuril Islands: Iturup, Zelenyi (Pietsch *et al.*, 2001). Islands of the Japanese archipelago: Hokkaido, Honshu from its northern part and to the south up to the Niigata prefecture along the western coast and the Fukushima prefecture along the eastern coast (Okada and Ikeda, 1937; Nakamura, 1963; Onodera and Honma, 1976; Kuruwaka, 1977; Hosoya, 1993; Sakai, 1995).

It should also be mentioned that the supposition of Gritsenko (1974) that precisely *T. sachalinensis* (=*T. ezoe*) was found by Lindberg and Dul'keit (1929) in Lake Bol'shoe on the Bol'shoi Shantar Island is not supported by new data (Alekseev *et al.*, 2004). In relation, we note that all four specimens of redfins from this lake that we analyzed are identified as *T. hakuensis*: predorsal scales 34, 35, and 36; scales in the lateral line 69, 74, 76, and 76; the posterior edge of the swimming bladder pointed; the end of CSO does not pass within parietale; suprapraeoperculum absent.

Remarks. Neither the label on the type material of *L. sachalinensis* nor the description of this taxon proper (Nikolsky, 1889) give an unambiguous idea of the site and period of fish collecting. However, in the vicinity of the city Aleksandrovsk-Salhalinskii (former Aleksandrovsk or Due) there is only one river—Bol'shaya Aleksandrovka (former Aleksandrovka or Duika) that was studied by Polyakov and Nikolsky immediately after their arrival on Sakhalin from June 14 to July 23, 1881 (Polyakov, 1883; Nikolsky, 1889). Therefore, one can state with assurance that the type material was collected precisely in this river in June–July, 1881, rather than in 1883 when both researchers had already left the island (Nikolsky in 1881 and Polyakov in 1882).

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[3] The study material: Bol'shoi Shantar Island, Lake Bol'shoe, Sept. 13, 2002 (collector M. B. Skopets)—4 specimens (SL 105–109 mm); Sakhalin, Bay Astokh (Pil'tun), Aug. 18, 2001 (S.V. Shedko)—8 specimens (SL 78–142 mm); the Ulike River (Tumnin), Aug, 2002 (G. V. Novomodnyi)—2 specimens (SL 100–105 mm); the Koppi River, June 2000 (M. V. Skopets)—12 specimens (SL 96–117 mm); the Amgu River, Oct. 8, 1998 (S.V. Shedko)—10 specimens (SL 92–156 mm).

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