

A REVIEW OF THE SPECIES OF THE TEN-SPINED STICKLEBACKS OR PYGOSTEUS FROM EAST ASIA.

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In the present paper a review of the species of *Pygosteus* (Family Gasterosteidae) known to inhabit the waters of East Asia and Japan is given. It is based on material in the Zoological Museum of the Imperial Academy of Sciences in St. Petersburg and specimens in the U. S. National Museum.

I. PYGOSTEUS PUNGITIUS (Linnæus).

Gasteracanthus pungitius PALLAS, Zoogr. Rosso-Asiat., III, 1811, p. 228 (Kamchatka, sea of Okhotsk).

Gasterosteus pungitius brachypoda BEAN, Proc. U. S. Nat. Mus., IV (1881), 1882, p. 240 (Alaska).

Gasterosteus pungitius NIKOLSKY, Mem. Acad. Sci., Petersburg, LX, 1889, sup. No. 5, p. 292 (Sakhalin, river Tym, No. 6592, Siska).

Gasterosteus pungitius HERZENTSTEIN and WARPACHOWSKI, Trud. Soc. Nat. Petersburg, XIX, 1887, p. 16 (Amur, at Kalgho; No. 2362 ex parte, another specimen = *P. sinensis*).

Pygosteus pungitius JORDAN and GILBERT, Fish. Bering Sea, 1899, p. 444 (Petropaulski Harbor, lake near Tareinsky Bay).

We have specimens from mouths of the Yana River (No. 10204 coll. Bunge); Kolyma River, Verkhne-Kolymsk (Nos. 10410, 10072 coll. Czerski); Sea of Okhotsk (No. 4393 coll., Middendorff), Ajan (Sea of Okhotsk, No. 2384 coll., Wosnessensky); west coast of Kamchatka (No. 2385 coll., Wosnessensky); Avacha Bay (Petropaulski, Kamchatka, No. 2362 coll., Schrenck); Alaska (No. 2402 coll., Russ.-Amer. Company); Sitka (No. 2390 coll., Wosnessensky); Amur River at Kalgho (No. 2363 coll., Schrenck); Tym River and Siska River in Sakhalin (No. 6591-2, 6588 coll., Poljakow); Japan, Hakodate (No. 2367 coll., Maximoviez). Messrs. Jordan and Starks^a do not indicate this species for Japan. Japanese specimens differ in no respect from European. A circumpolar species: I have seen *P. pungitius* from Khatanga, Pechora, Archangelsk, Lapland.

^aProc. U. S. Nat. Mus., XXVI, 1902, p. 61.

2. PYGOSTEUS TYMENSIS (Nikolsky).

Gasterosteus tymensis NIKOLSKY, Mem. Acad. Sci. Petersburg, LX, 1889, p. 293 (Sakhalin Island, Tymi River, Nos. 6593-5).

Pygosteus undecimalis JORDAN and STARKS, Proc. U. S. Nat. Mus., XXVI, 1902, p. 62, fig. (Chitose in Hokkaido).

Our specimens from Sakhalin (Nos. 6593-6595) differ in no respect from the Japanese. Dorsal spines XI-XII. This species differs from *P. pungitius* in having very short dorsal and ventral spines and a much feebler keel on the caudal peduncle. The exterior processes of the pubic bone are only slightly developed. As remarks Nikolsky^a *P. tymensis* is allied to an "abnormal variety of *P. pungitius*," described by F. Day^b from Ireland as having a badly marked keel on the side of the tail, and ventral spines lacking or very small.

3. PYGOSTEUS SINENSIS (Guichenot).

Gasterosteus sinensis GUICHENOT, Nouv. Arch. Mus. Hist. Nat. Paris, V, 1869, p. 204, pl. XII, fig. 4 (China, Yang-tse-Kiang? a small specimen, 35 mm.).—SARGAGE, Nouv. Arch. Mus. Hist. Nat. Paris, X, 1874, p. 33 (same specimen).

Gasterosteus japonicus STEINDACHNER, Sitzber. Ac. Wien, mat.-nat. Cl., LXXXII, 1880, p. 264, pl. III, fig. 2 (Gulf of Strielok, near Vladivostok).

Gasterosteus bussci WARPACHOWSKI in Herzenstein and L. Warpachowski, Trud. Soc. Natur. Petersburg, XIX, 1887, pp. 13, 54, fig. 1 (Lefu River, tributary of Khanka Lake, basin of Amur; No. 7100).

Pygosteus steindachneri JORDAN and SYNDER, Proc. U. S. Nat. Mus., XXVII, 1901, p. 747, after Steindachner.—JORDAN and STARKS, Proc. U. S. Nat. Mus., XXVI, 1902, p. 61 (Tokyo, Aomori, Yamashiro).

Pygosteus sinensis JORDAN and STARKS, Proc. U. S. Nat. Mus., XXVIII, 1905, p. 203 (Gensan).

We have specimens from Lefu River, a tributary of Khanka Lake (No. 7100 coll., Pleske), from Ussuri (No. 13761 coll., Paltshewsky), Da-chu-ang, tributary of Sungari (No. 13799 coll., Mjachkow), Gulf of Ussuri, near Vladivostok (No. 13800 coll., Paltshewsky), Amur River at Kalgho (No. 2363a coll., Schrenk), Hakodate (No. 2368 coll., Maximovicz). This species differs from *P. pungitius* only in having the sides of the body mailed; but the more recently described *P. sinensis wosnessenskyyi* from Kamchatka with very reduced lateral armature connects *P. sinensis* with *P. pungitius*. More abundant material would permit us, I think, to accept *P. sinensis* as a mailed variety of *P. pungitius*. The form of the lateral processes of the pubic bone is subject to much variation even in specimens from the same locality. The length of the dorsal and ventral spines depends on the age of the individual; in adults, spines are shorter while in young ones they are longer (see table).

^aMem. Acad. Sci. Petersburg, LX, 1889, p. 293.

^bF. Day, Fishes of Great Britain and Ireland, I, 1880-84, p. 245, pl. LXVIII, fig. 4.

PYGOSTEUS SINENSIS STENURUS (Kessler).

(*Gasterosteus stenurus* KESSLER in Przewalski, Mongolia, and the land of Tanguts, 1876, Fishes, p. 6, pl. III, fig. 6 (Dalai-nor, 43° N.).

We have specimens from Lake Dalai-nor in E. Mongolia (No. 2471 type-specimens) which differ from *P. sinensis* in having a more slender body. The depth of the body is contained 6 times in the total length without caudal, while in *sinensis* 5-5½. The lateral armature is usually but little developed, the shields being small.

PYGOSTEUS SINENSIS WOSSNESSENSKYI (Kessler).

(*Gasterosteus wossnessenskyi* KESSLER, in Przewalski, Mongolia, and the land of Tanguts, 1876, p. 9 (west coast of Kamchatka; Nos. 2377-8).

We have specimens from Kamchatka (No. 2377-8 coll., Wossnessensky). The lateral armature is much less developed, even in the anterior part of body frequently wanting. Length to 90 mm.

Name and locality.	Number of dorsal spines.	Total length of body with caudal (mm.).	Total length of body without caudal (length).	Depth of body in length.	Length of head in length.	Length of eye in mm.	Length of middle dorsal spine in mm.	Length of ventral spine in mm.	Length of ventral spine in the length of head.
<i>Pygosteus pungitius.</i>									
Onega L. (N. Russia).....	X	58½	51	5.1	3.6	4	3	6	2.33
Hakodate	IX	59	52	5.2	3.7	4	3	6	2.33
Ajan (sea of Okhotsk)	XI	61	54	4.7	3.8	4½	3	6	2.33
Alaska	XI	89	79	4.9	4.3	4	3½	6	3.01
<i>P. sinensis.</i>									
Khanka L. (Amur R.).....	IX	60½	54½	5.4	4.4	3½	2½	6	2.01
Vladivostok	IX	77	70	5.3	4.7	4	2½	6	2.01
Ussuri R.	IX	41	36	4.8	3.6	3	3	5½	1.74
Sungari R.	VIII	38½	34	5.2	4.0	2½	2½	4½	1.88
Hakodate	IX	50	44	4.9	3.7	3½	2½	4½	2.52
<i>P. sinensis stenurus.</i>									
Dalai-nor (Mongolia).....	IX	61½	55	6.1	3.9	1	3	5	2.80
	IX	55	49	6.1	4.1	3½	2½	5½	2.18
<i>P. sinensis wossnessenskyi.</i>									
Kamchatka	IX	70	63	5.0	3.7	4½	3	5½	2.96
	IX	87	70	6.1	4.1	5	4	6	3.16
<i>P. tymanis.</i>									
Sakhalin	XII	60	52	5.0	3.5	5	1	2	7.5

The following is a synopsis of the known Eurasiatic species of *Pygosteus*:

- a. Caudal peduncle laterally with a well developed keel.
- b. Anterior part of body naked, without bony plates.
- c. Lateral [exterior, upper] processes of the pubic bone well developed, ventral spine long, 1¼-3 in head; dorsal spines high. Circumpolar.....*P. pungitius*.

- cc. Lateral processes of the pubic bone almost wanting, ventral spine short, 5-7½ in head; dorsal spines very low. Sakhalin, N. Japan... *P. tyemensis*.
- bb. Anterior part of body with vertical bony plates.
- d. Plates well developed, depth of body 4½-5½ in total length (without caudal). Amur, Vladivostok, Japan, Korea, China (Yang-tse-kiang?)... *P. sinensis*.
- dd. Plates less developed, depth of body 6 in total length (without caudal). Dalai-nor Lake in E. Mongolia *P. sinensis stemurus*.
- ddd. Plates less developed, sometimes on the anterior part of the body interrupted or wanting. Kamchatka *P. sinensis wossnessenskiji*.
- aa. Caudal peduncle smooth, laterally without keel.
- e. Anterior part of body naked. France, England..... *P. laevis*.
- ee. Anterior part of body more or less protected with vertical bony plates. Many varieties in Black, Caspian, and Aral seas..... *P. platygaster*.^a

^a *Gasterosteus platygaster* Kessler, Bull. Soc. Nat. Moscou, XXXII, 1859, Pt. 2, p. 202 (Odessa, mouth of Dnieper.)