

Comments on Puffers of the Genus *Takifugu* from Russian Waters with the First Record of Yellowfin Puffer, *Takifugu xanthopterus* (Tetraodontiformes, Tetraodontidae) from Sakhalin Island

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Abstract In August 2015 a single specimen of *Takifugu xanthopterus* was collected at the mouth of the Lyutoga River in Aniva Bay, southern Sakhalin Island in the southern Sea of Okhotsk. This is the first discovery of this species from Sakhalin Island, and represents the northernmost record for the species. Also we report eight species of *Takifugu* from Russia based on newly collected specimens, our survey of literature and the fish collection of the Zoological Institute, Russian Academy of Sciences.

Key words: Puffers, *Takifugu*, taxonomy, Sakhalin, new record

Introduction

Sakhalin Island is the largest island of the Russian Federation and surrounded by the Seas of Japan and Okhotsk (Fig. 1). The west coast of Sakhalin is washed by the warm Tsushima Current and the east coast by the cold East Sakhalin Current. Puffers of the family Tetraodontidae in the Far East of Russia are transported from southern warm waters, and most species have rarely been recorded around the end of summer and the beginning of autumn, when the water is relatively warm (Lindberg *et al.*, 1997; Parin, 2003; Sokolovsky *et al.*, 2011; Parin *et al.*, 2014). However, some species of the genus *Takifugu* seem to spawn in summer along the coast of southern Primorsky Krai in Peter the Great Bay (Fig. 1), because juveniles of *Takifugu niphobles* (Jordan and Snyder, 1901), *T. por-*

phyreus (Temminck and Schlegel, 1850) and *T. rubripes* (Temminck and Schlegel, 1850) have been collected in this area (see Schmidt, 1904; Lindberg *et al.*, 1997; Sokolovsky *et al.*, 2011).

During the course of study on the fish fauna of Sakhalin Island by the first author, specimens of the genus *Takifugu* have become available for our study on taxonomy of puffers of Sakhalin Island. We herein report puffers found in the Far East of Russia with the first record of *T. xanthopterus* (Temminck and Schlegel, 1850) from Sakhalin Island.

Materials and Methods

Measurements and counts follow Dekkers (1975) with some additions by Lindberg *et al.* (1997). Standard, total and head lengths are abbreviated as SL, TL and HL, respectively.

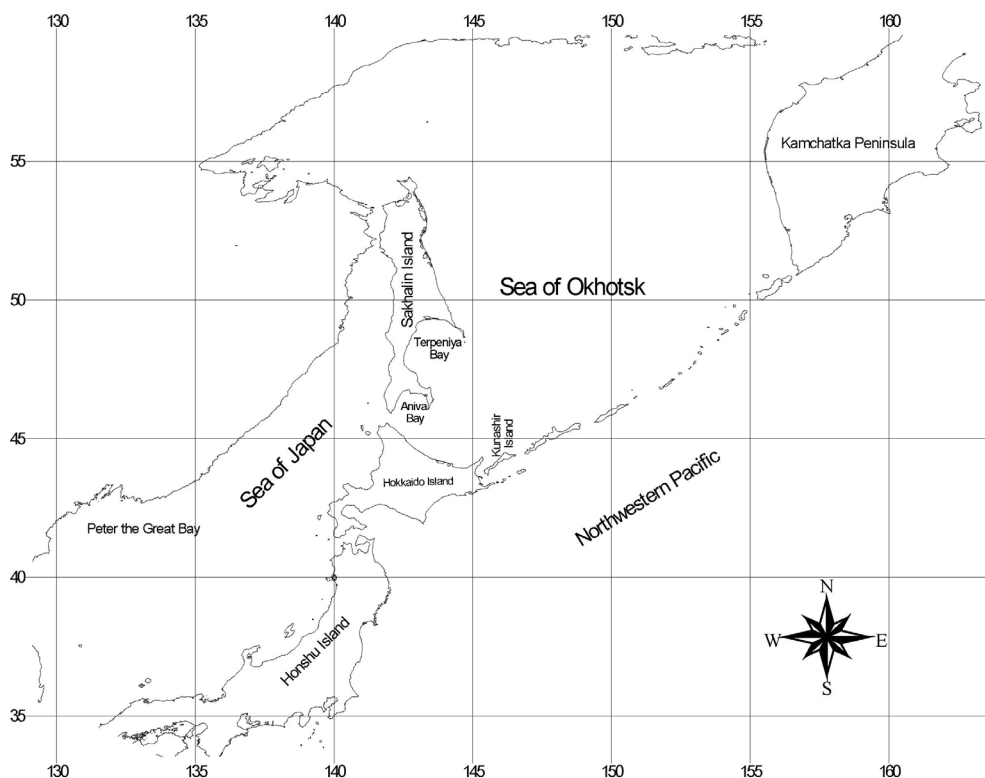


Fig. 1. Map of Sakhalin Island and surrounding areas.

Specimens of *Takifugu poecilonotus* (Temminck and Schlegel, 1850) deposited at the Laboratory of Ichthyology, Zoological Institute, Russian Academy of Sciences, St. Petersburg (ZIN RAN) are examined. Newly collected specimens of *T. rubripes* and *T. xanthopterus* are provisionally stored in Federal Government Budget Institution (FGBI), Sakhalinrybvod, but in the near future, these specimens will be transferred for permanent storage to the Sakhalin Regional Museum, located at Kommunisticheskiy prospekt, 29, Yuzhno-Sakhalinsk, Russia.

Puffers of the Genus *Takifugu* Recorded from Russia Including Sakhalin Island

Our survey of literature and the fish collection of the ZIN has revealed that the following eight species of the genus *Takifugu* occur in the Far East of Russia: *Takifugu niphobles* (Jordan and Snyder, 1901), *T. pardalis* (Temminck and Schlegel, 1850), *T. poecilonotus* (Temminck and Schlegel, 1850), *T. porphyreus* (Temminck and Schlegel, 1850), *T. rubripes* (Temminck and Schlegel, 1850), *T. stictonotus* (Temminck and Schlegel, 1850), *T. vermicularis* (Temminck and Schlegel, 1850) and *T. xanthopterus* (Temminck and Schlegel, 1850). In addition, we obtained specimens of *Takifugu porphyreus*, *T. rubripes* and *T. xanthopterus* from the southern coast of Sakhalin (Fig. 2).

Kottelat (2013) has recently showed that the genus *Takifugu* is a synonym of the genus *Gastrophysus*, because the type species of the two genera is *Tetrodon oblongus* Bloch, 1786. Thus *Takifugu* is an objective junior synonym of *Gastrophysus*. However, it is important to note that there are a number of problems if we accept Kottelat's proposal, because the generic name *Takifugu* has long been used in many papers and books, particularly in Japan, Korea, China, and Taiwan, where puffers of *Takifugu* are commer-

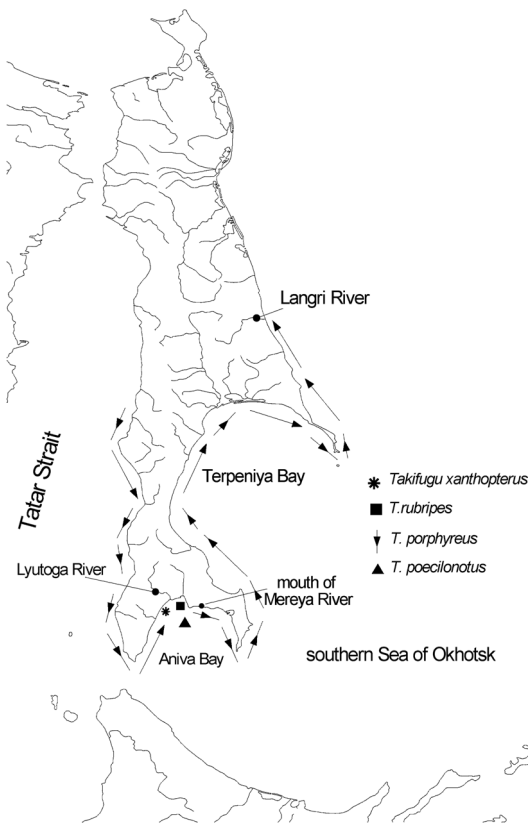


Fig. 2. The distribution records of *Takifugu poecilonotus*, *T. porphyreus*, *T. rubripes* and *T. xanthopterus* at Sakhalin Island.

cially important. In addition to this, *Gastrophysus* has frequently been applied to puffers of the genus *Lagocephalus*, which contains about 10 species, including edible species (at least muscle is edible in *L. inermis*, *L. gloveri*, and *L. spadiceus*) and strongly toxic species such as *L. lunaris* and *L. sceleratus*. In Chinese publications the generic name *Gastrophysus* is still applied to species of *Lagocephalus*. Thus, if *Gastrophysus* is applied to species of *Takifugu*, it would result in major confusion in the classification of puffers in East Asia. When considering food security and fishery industry sustainability we should be careful about the use of generic names of puffers. Matsuura (2015) has stated that he would request the International Commission on Zoological Nomenclature to suppress *Gastrophysus*. Considering this situation, we use generic name



Fig. 3. *Takifugu poecilonotus* collected from Sakhalin Island: ZIN 31566 (one of 6 specimens.), ZIN 31567 (one of 20 specimens). Photographed by B. A. Sheiko.

Takifugu for puffers of the Far East of Russia.

Takifugu niphobles (Jordan and Snyder, 1901) – Grass Puffer

In Russian waters this species is rarely seen from the continental coast of Sea of Japan, including Peter the Great Bay and Primorsky Krai (Taranets, 1937; Lindberg *et al.*, 1997; Sokolovskaya *et al.*, 1998; Parin, 2003; Kolpakov, 2003; Sokolovsky *et al.*, 2007, 2011; Ivanov and Sukhanov, 2008). It occurs mainly in coastal areas, but is also found in brackish waters and enters the lower reaches of rivers (Kato *et al.*, 2005, 2010). Although this species was recorded from Aniva Bay, Sakhalin Island by Lindberg *et al.* (1997), an examination of the specimens used in their study (ZIN 31566 and ZIN 31567) has revealed that they are not *T. niphobles* but *T. poecilonotus* (Fig. 3). The white spots of the photographed specimens are much larger than those of *T. niphobles* in which the spots are equal to or smaller than the pupil.

Takifugu pardalis (Temminck and Schlegel, 1850) – Panther Puffer

This species has rarely been recorded in Russia from Peter the Great Bay (Taranets, 1937; Lindberg *et al.*, 1997; Sokolovskaya *et al.*, 1998; Parin, 2003; Shelekhov, 2005; Sokolovsky *et al.*,



Fig. 4. *Takifugu rubripes* (242 mm SL) collected around the mouth of Lyutoga River in Aniva Bay, Sakhalin Island. Photographed by S. S. Makeev.

2007, 2011), although it is commonly found in the waters of Japan and Korea (Amaoka *et al.*, 1989; Kim *et al.*, 2009).

Takifugu poecilonotus (Temminck and Schlegel, 1850) – Fine Patterned Puffer, Fig. 3.

In Russian waters Nikolskii (1903) recorded it from Vladivostok without voucher specimens. Poltev (2012) reported that this species was captured at the mouth of Mereya River (Fig. 2), Aniva Bay, Sakhalin Island in early October 2010. His brief morphological descriptions and photographs do not allow us to confirm his identification. However, as stated above in the section of *T. niphobles*, we confirmed that *T. poecilonotus* occurs in Aniva Bay.

Takifugu porphyreus (Temminck and Schlegel, 1850) – Purple Puffer.

In Russian waters, it is known from Sakhalin Island, the coast of Primorsky Krai, and southern Kurils (Lindberg *et al.*, 1997; Sokolovskaya *et al.*, 1998; Ivanov and Sukhanov, 2002, 2008; Shelekhov, 2005; Velikanov, 2006, 2008; Velikanov and Stominok, 2006; Sokolovsky *et al.*, 2007, 2011; Gudkov, 2010; Poltev and Koynov, 2011; Velikanov *et al.*, 2016). In the waters around Sakhalin Island this species is quite common and distributed from southwestern (up to the central part of the island) and north-eastern parts (at estuary of the Langeri River) including Aniva Bay. It is known from coastal areas, but can be found in brackish waters. In

summer, it is quite common along the coast of Primorsky Krai (Sokolovsky *et al.*, 2007, 2011).

Takifugu rubripes (Temminck and Schlegel, 1850) – Tiger Puffer, Fig. 4, Table 1.

In the waters of Sakhalin Island this species has been recorded from the southern area as mentioned in the papers by Rass (1983) and Lindberg *et al.* (1997) without voucher specimens. A 242 mm SL specimen of *T. rubripes* caught in February 2005 in the estuary of Lyutoga River in Aniva Bay (Fig. 4, Table 1) represents the first specimen-based record of this species from Sakhalin. This species occurs usually in coastal areas, but also enters the lower reaches of rivers. According to genetic studies by Song *et al.* (2001) and Reza *et al.* (2008, 2011) *Takifugu chinensis* and *Takifugu pseudommus* are synonyms of *Takifugu rubripes*.

Takifugu snyderi (Abe, 1988) – Vermiculated Puffer, Fig. 5B.

In Russian waters this species has rarely been recorded under the name of *Takifugu vermicularis* (Temminck and Schlegel, 1850) from the coast of Primorsky Krai, Olga Bay and Peter the Great Bay (Lindberg *et al.*, 1997; Parin, 2003; Shelekhov, 2005; Sokolovsky *et al.*, 2007, 2011; Ivanov and Sukhanov, 2008). However, Abe (1947) stated that a pufferfish found in Japan and the adjacent waters including Far East Russia is not *Takifugu vermicularis* (Temminck and Schlegel, 1850) but another subspecies, *Fugu vermicu-*

Table 1. Counts and proportional measurements of *Takifugu xanthopterus* and *T. rubripes* caught in Aniva Bay, Sakhalin Island.

Fin ray counts	<i>T. xanthopterus</i>	<i>T. rubripes</i>
Dorsal-fin rays	15	14
Anal-fin rays	12	13
Pectoral-fin rays	15	14
As % of SL		
SL (mm)	175	242
TL (mm)	210	294
Head length	30.9	28.9
Length of longest dorsal-fin ray	16.0	14.5
Length of shortest dorsal-fin ray	2.9	4.1
Maximum body depth	31.4	28.1
Body width at pectoral-fin base	28.0	26.0
Distance from snout to dorsal-fin origin	64.6	62.8
Distance from snout to anal-fin origin	62.9	57.8
Caudal fin length	20.6	18.6
Caudal peduncle length	20.0	20.7
Caudal peduncle depth	9.7	8.3
As % of HL		
Snout length	48.1	51.4
Interorbital distance	59.3	57.1
Eye diameter	16.7	14.3
Nasal organ length	11.1	11.4
Tip of snout to nasal organ	27.8	25.7
Eye to nasal organ	13.0	15.7
Mouth width	31.5	32.9
Upper-lip depth	7.4	7.1
Dorsal-fin base length	40.7	42.9
Anal-fin base length	40.7	42.9
Caudal peduncle width	18.5	21.4

laris radiatus (Abe, 1947) (Fig. 5A in this paper). However Abe (1988) pointed out that *F. vermicularis radiatus* is a junior synonym of the true *T. vermicularis* (Temminck and Schlegel, 1850). This means that the pufferfish, which had long been recognized as *T. vermicularis* (Fig. 5B) in Japan, Korea and Russia, lost the scientific name. This led Abe (1988) give this pufferfish a new name, *Fugu vermicularis snyderi*. However, *Fugu* is a junior synonym of *Takifugu* (Matsuura, 1990) and Abe's subspecies differs clearly at the species level from other species of *Takifugu*. Therefore, it has been identified as *Takifugu snyderi* by many authors (Matsuura, 1997; Yamada *et al.*, 2007; Yamada and Yagishita, 2013; Ikeda and Nakabo, 2015).

Takifugu stictonotus (Temminck and Schlegel, 1850) – Spottyback Puffer

In Russian waters it has rarely been recorded from the coast of Primorsky Krai, including Olga Bay (Taranets, 1937; Lindberg *et al.*, 1997; Parin, 2003; Sokolovsky *et al.*, 2007, 2011).

Takifugu xanthopterus (Temminck and Schlegel, 1850) – Yellowfin Puffer. Fig. 6, Table 1.

In Russian waters this species has been known from the Sea of Japan, the coast of Primorsky Krai, Rynda Bay and Peter the Great Bay (Taranets, 1937; Lindberg *et al.*, 1997; Sokolovskaya *et al.*, 1998; Kolpakov and Kolpakov, 2002; Kolpakov, 2003; Parin, 2003; Sokolovsky *et al.*, 2007, 2011; Ivanov and Sukhanov, 2010); it was also recorded from Samarga River in the north-eastern Primorye at the southern part of Tatar Strait (Orlov, 2013). Although it is usually rare in



Fig. 5. A, *Takifugu vermicularis* (Temminck and Schlegel, 1850), FAKU 139922, 222 mm SL, Maizuru, Sea of Japan, photographed by F. Tashiro; B, *Takifugu snyderi* (Abe, 1988), KAUM-I. 27764, 166 mm SL, Satsuma Peninsula, Kyushu, Japan, photograph courtesy by KAUM.

Russian waters, sometimes many individuals were captured in Peter the Great Bay (e.g., 1 ton catch in August 2001, see Orlov, 2013).

A young specimen (175 mm SL, 219 g in weight) of this species was collected from Sakhalin waters for the first time on 25 August 2015. Water temperatures according to the satellite monitoring in this period reached to 20°C (see online: <http://www.sakhniro.ru/news/467/>). The specimen was captured by set net placed 350 meters off the coast, (according to the fisherman V.A. Molokov; 46°42'00"N, 142°37'30"E, 1.5 km east of the mouth Lyutoga River, Aniva Bay).

The specimen has three oblique broad bluish-black stripes on the light bluish dorsolateral part of the body. All fins are yellow. A black spot is located on the pectoral-fin base. Spinules are dis-

tributed on the dorsal surface of the head and body from the nasal organs to the dorsal-fin origin. A longitudinal skin fold runs along the ventrolateral side of the body from the region just behind the mouth to the caudal-fin base. A lateral line courses along the mid-lateral body from the caudal-fin base to above the pectoral-fin base where it branches into two lines, one crossing over the nape to meet the opposite element and the other encircling the eye.

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Fig. 6. *Takifugu xanthopterus* (175 mm SL) collected around the mouth of Lyutoga River in Aniva Bay, Sakhalin Island. Photographed by S. S. Makeev.

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