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# Taxonomic and Nomenclatural Comments on Two Puffers of the Genus *Takifugu* with Description of a New Species, *Takifugu flavipterus*, from Japan (Actinopterygii, Tetraodontiformes, Tetraodontidae)

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**Abstract** Grass Puffer and Fine Patterned Puffer are commonly found around Japan and adjacent regions. The scientific name, *Takifugu niphobles* (Jordan and Snyder, 1901), has long been applied to the Grass Puffer, and *Takifugu poecilonotus* (Temminck and Schlegel, 1850) to the Fine Patterned Puffer. However, examination of type specimens of *Takifugu niphobles* and *Tetrodon alboplumbeus* Richardson, 1845 revealed that the former is a junior synonym of the latter. Furthermore examination of eleven syntypes of *Tetraodon poecilonotus* Temminck and Schlegel, 1850 indicated that this syntypic series includes two species of *Takifugu*, the Grass Puffer and the Fine Patterned Puffer. When Boeseman published in 1947 a review of fish collections studied by Temminck and Schlegel, he designated many lectotypes for Japanese fishes. He selected a syntype (RMNH 4038a, 127 mm SL) as the lectotype of *Tetraodon poecilonotus*. However, this specimen is not the Fine Patterned Puffer but the Grass Puffer. Thus Boeseman's lectotype designation made *Tetraodon poecilonotus* Temminck and Schlegel, 1850, a junior synonym of *Tetrodon alboplumbeus* Richardson, 1845, and results in the Fine Patterned Puffer lacking a scientific name and description. To resolve this taxonomic problem, the Fine Patterned Puffer is described as a new species, *Takifugu flavipterus*.

**Key words:** Synonym, taxonomy, Japan, distribution.

## Introduction

Grass Puffer and Fine Patterned Puffer are commonly found around Japan and adjacent regions. The scientific name, *Takifugu niphobles* (Jordan and Snyder, 1901), has long been applied to the Grass Puffer, and *T. poecilonotus* (Temminck and Schlegel, 1850) to the Fine Patterned Puffer. However, during a course of taxonomic studies on puffers of the genus *Takifugu*, I found that the original description of *Tetrodon alboplumbeus* Richardson, 1845, suggested that it is a senior synonym of *Spheroides niphobles* Jordan and Snyder, 1901. Although Richardson's description is short and not detailed to discriminate his species, his figures (Richardson, 1845: pl. 58, figs. 6 and 7) are adequate to show that *T. alboplumbeus* is the same as *S. niphobles*. In addition to this, I have recently had an opportunity to visit the Natural History Museum, London to examine type specimens of tetraodontiforms including puffers. My examination of the holotype of *T. alboplumbeus* clearly indicated that it is a senior synonym of *S. niphobles*. Upon my request Tomio Iwamoto and Jon Fong of the California Academy of Sciences, San Francisco, examined the holotype of *S. niphobles* and sent me photographs. Their assistance confirmed my conclusion on the senior synonym status of *T. alboplumbeus*.

Following my visit to London, I visited the Netherlands Centre for Biodiversity Naturalis, Leiden where many type specimens of fishes described by Temminck and Schlegel (1850) are

deposited. My examination of 11 syntypes of *Tetraodon poecilonotus* Temminck and Schlegel, 1850 revealed that the syntypic series comprises two species, the Grass Puffer and the Fine Patterned Puffer.

When Boeseman (1947) published a review of fish collections of Burger and von Siebold that were studied by Temminck and Schlegel (1850), he designated many lectotypes for Japanese fishes. His lectotype designation for *Tetraodon poecilonotus* resulted in confusion with respect to the taxonomy of puffers in the genus *Takifugu*. He selected a syntype (RMNH 4038a, 127 mm SL) as the lectotype of *Tetraodon poecilonotus*. However, this specimen is not the Fine Patterned Puffer but, rather, the Grass Puffer. Boeseman's lectotype designation made *Tetraodon poecilonotus* Temminck and Schlegel, 1850, a junior synonym of *Tetrodon alboplumbeus* Richardson, 1845. In addition to this, his lectotype designation resulted in the Fine Patterned Puffer lacking a scientific name and description.

*Takifugu alboplumbeus* (Richardson, 1845) is redescribed below on the basis of examination of the holotype with notes on its synonymy. The Fine Patterned Puffer is described as a new species under the name of *Takifugu flavipterus*.

## Materials and Methods

Specimens used in this study are deposited in the following museums and universities: Natural History Museum, London (BMNH); California Academy of Sciences, San Francisco (CAS); Kyoto University Museum, Maizuru (FAKU); Hokkaido University Museum, Hakodate (HUMZ); Kagoshima University Museum, Kagoshima (KAUM); National Museum of Marine Biology and Aquarium, Pingtung (NMMB); Department of Zoology, National Museum of Nature and Science, Tsukuba (NSMT); Netherlands Centre for Biodiversity Naturalis, Leiden (RMNH).

Methods for counts and measurements follow Dekkers (1975) with the following exceptions: eye diameter is taken as the largest diameter of the exposed eye, fin-ray counts include all visible rays, both branched and unbranched, and pectoral-fin ray counts include the uppermost rudimentary ray. Radiographs were used to count the number of vertebrae. Paratype data are shown in parentheses when different from the holotype. Standard and total lengths are abbreviated as SL and TL, respectively. Measurements were made with calipers to the nearest 0.1 mm.

### ***Takifugu alboplumbeus*** (Richardson, 1845)

[Japanese name: Kusa-fugu]

[English name: Grass Puffer]

(Figs. 1–5)

*Tetrodon albo-plumbeus* Richardson, 1845: 121, pl. 58.
*Tetraodon poecilonotus* Temminck and Schlegel, 1850: 279.
*Spheroides niphobles* Jordan and Snyder, 1901: 240, fig. 3.

*Specimens examined*. Holotype (BMNH 1980.3.6.1, 77.5 mm SL, China seas, Canton) of *Tetrodon alboplumbeus*; holotype (CAS-SU 6256, 118 mm SL, Japan, Tokyo) of *Spheroides niphobles*; lectotype (RMNH 4038a, 127 mm SL, Japan) and 4 paralectotypes (RMNH 4038b, c, d, e, 40.4–80.6 mm SL, Japan) of *Tetraodon poecilonotus*.

JAPAN: FAKU 138215 (112 mm SL, Sea of Japan, Wakasa Bay, Maizuru), FAKU 138216 (101 mm SL, data same as FAKU 138215), FAKU 138217 (93.3 mm SL, data same as FAKU 138215), HUMZ 45104 (90.1 mm SL, Japan, Oita Prefecture, Kamiura), HUMZ 101372 (118 mm SL, Japan, Izu Islands, Izu-oshima Island), HUMZ 132049 (124 mm SL, Sea of Japan, Hokkaido, Okushiri Island), HUMZ 218033 (101 mm SL, Sea of Japan, Shimane Prefecture, Okino-shima Island), NSMT-P 77803 (96.0 mm SL, Japan, Kagoshima Prefecture, Tanega-shima Island). TAIWAN: NMMBP 5221 (81.4 mm SL, Taiwan, Penhow).

*Description of the holotype*. Dorsal-fin rays 12; anal-fin rays 10; pectoral-fin rays 16; vertebrae 8 + 13 = 21. Head length 32.9% SL, snout length 14.3% SL, snout to dorsal-fin origin 68.8% SL, snout to anal-fin origin 69.4% SL,

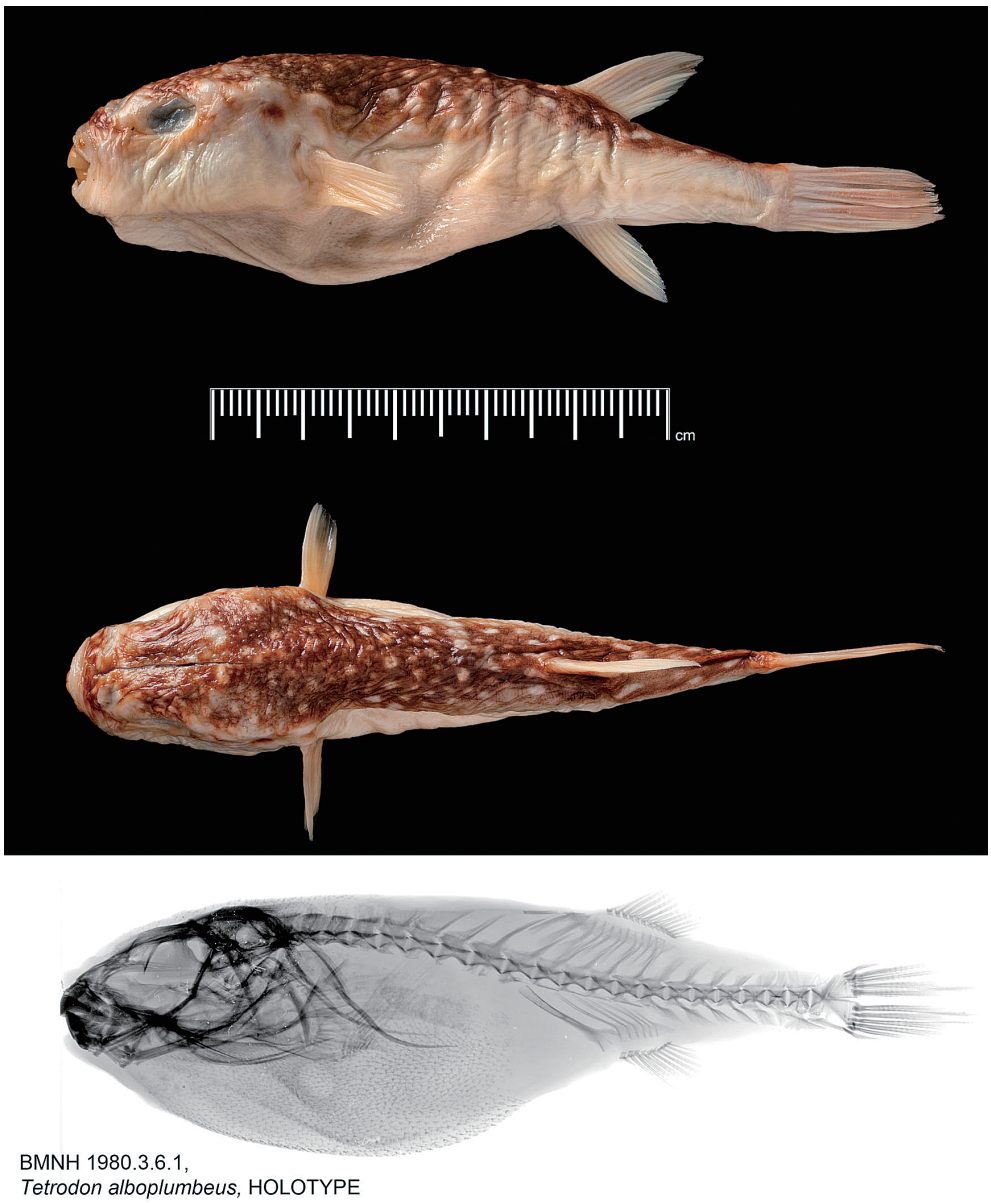


Fig. 1. Holotype of *Tetrodon alboplumbeus* Richardson, 1845, BMNH 1980.3.6.1, 77.5 mm SL, Chinese seas. Top, lateral view; middle, dorsal view; bottom, radiograph. Courtesy of BMNH.

body width at pectoral-fin base 19.4% SL, body depth at anal-fin origin 18.1% SL, depth of caudal peduncle 8.8% SL, length of caudal peduncle 22.5% SL, gill opening length 8.4% SL, eye diameter 6.7% SL, bony interorbital width 7.9% SL, snout to anterior edge of nasal organ 9.8% SL, posterior edge of nasal organ to anterior edge of eye 3.1% SL, length of dorsal-fin base 11.6% SL, length of anal-fin base 8.8% SL, longest dorsal-fin ray 17.4% SL, longest anal-fin ray 17.7% SL, longest pectoral-fin ray 16.8% SL, caudal-fin length 25.2% SL.

A longitudinal skin fold extending along the ventro-lateral edge of the body from chin to cau-

Fig. 2. *Takifugu alboplumbeus*. Top, KAUM-I. 11491, 64.3 mm SL, Japan, Kagoshima Prefecture, Yaku-shima Island, mouth of Miyanoura River; bottom, NSMT-P 77803, 96.0 mm SL, Japan, Kagoshima Prefecture, Tanega-shima Island, Koume River.

dal peduncle; two openings in nasal organ wide; the dorsal surface of head and body covered with spinules, extending from the nasal organs to the caudal-fin base; the ventral surface of head and body covered with spinules, extending just posterior to the lower jaw to slightly before the anus; spinules also distributed in front of gill opening; dorsal and anal fins slightly pointed; pectoral fin rounded; caudal fin slightly rounded.

*Color of fresh specimens* (Fig. 2). The dorsal half of head and body greenish brown with many white spots, all rounded and well defined, narrower than their interspaces; side of head and body below the dorsal end of the pectoral-fin base silvery white with yellow tinge; a longitudinal pale yellow stripe coursing along the ventrolateral edge from chin to the caudal-fin base; a large black blotch on the side of body just above the posterior part of pectoral fin, its lower half edged with white but the upper half not surrounded with white line; a large black blotch on the base of dorsal fin; iris red; dorsal and pectoral fins with pale yellow to yellowish orange rays and pale membranes; anal fin white; posterior half of caudal fin pale yellow or pale orange and anterior half of caudal fin pale.

*Color when alive* (based on underwater photograph, Fig. 3). Similar to fresh specimens, but colors of body and fins lighter.

*Distribution*. Japan, Korea, China, and Far East Russia.

*Remarks*. As seen in Figs. 1 and 4, the holotypes of *Tetrodon alboplumbeus* and *Spheroides niphobles* have the same color pattern: the dorsal half of the head and body dusky with many sharply defined white spots being clearly nar-

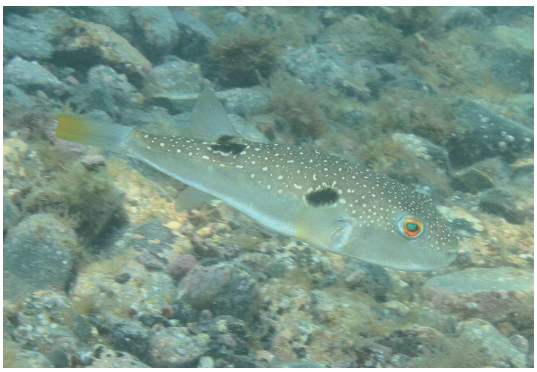

Fig. 3. Underwater photograph of *Takifugu alboplumbeus* (15 cm TL). Japan, Suruga Bay, west coast of Izu Peninsula, Osezaki, 1 m depth. Photograph by Keido Uchino.

rower than their interspaces; a large black blotch on the side of body just above the posterior part of the pectoral fin, its ventral half edged with white but the dorsal half not surrounded by white line. In addition to the color, there are no morphological differences between the two holotypes. These color patterns of the two holotypes are not found in any other species of *Takifugu* (Matsuura, 1984; Su and Li, 2002). These facts led me to conclude that *T. alboplumbeus* is a senior synonym of *S. niphobles*.

*Takifugu alboplumbeus* is commonly found in shallow waters along coasts of Japan from Hokkaido southward to Okinawa-jima Island of the Ryukyu Islands. It has been reported in many publications by Japanese ichthyologists (e. g., Matsuura, 1984, 1997; Yamada and Yagishita,


Fig. 4. Holotype of *Spheroides niphobles*, CAS-SU 6526, 118 mm SL, Japan, Tokyo. Top, lateral view; middle, dorsal view; bottom, ventral view. Photograph by Jon Fong.

Fig. 5. Lectotype (RMNH 4038a, 127 mm SL) and paralectotypes (RMNH 4038b–e, 40.4–80.6 mm SL) of *Tetraodon poecilonotus*. Photograph by Ronald de Ruiter.

2002). Ranges of fin-ray counts have been reported as follows by these authors: dorsal-fin rays 12–14, anal-fin rays 10–12 and pectoral-fin rays 13–17.

In their review of the gymnodont fishes of Japan, Jordan and Snyder (1901) reported *Spheroides alboplumbeus* (Richardson, 1845) as a distinct species. However, as shown above these two species are recognized as the same species.

As stated above, Boeseman (1947) designated many lectotypes for Japanese fishes described by Temminck and Schlegel (1850). His lectotype and four paralectotypes of *Tetraodon poecilonotus* (Fig. 5) are not the Fine Patterned Puffer, previously classified as *Takifugu poecilonotus*, but the Grass Puffer, *Takifugu alboplumbeus*.

***Takifugu flavipterus*** sp. nov.

[Japanese name: Komon-fugu]

[English name: Fine Patterned Puffer]

(Figs. 6–9)

*Holotype*. NSMT-P 124758, 104 mm SL, Japan, Honshu, Shimonoseki, Waku.

*Paratypes*. FAKU 135960, 76.7 mm SL, Sea of Japan, Wakasa Bay, Maizuru; FAKU 136311, 130 mm SL, data same as the preceding; FAKU 132937, 123 mm SL, Inland Sea of Japan, Yamaguchi Prefecture; FAKU 138101, 130 mm SL, Sea of Japan, Noto Peninsula, Ushitsu; FAKU 138102, 114 mm SL, data same as the preceding; FAKU S139, 120 mm SL, Sea of Japan, Tsushima Islands, Shikoe; FAKU S130, 144 mm SL, data same as the preceding; NSMT-P 124757, 148 mm SL, Japan, Honshu, Shimonoseki, Waku. RMNH 31693 (2 alcohol specimens, 62.1 and 107 mm SL), Japan; NSMT-P 127419, 149 mm SL (stained with Alizarin red), Sea of Japan, Wakasa Bay; RMNH 1576–1579 (4 stuffed spec-

Fig. 6. *Takifugu favipterus* sp. nov. Top, holotype, NSMT-P 124758, 104 mm SL, Japan, Honshu Island, Shimonoseki, Waku; middle, paratype, 124757, 148 mm SL, data same as the holotype; bottom, radiograph of holotype.

imens, 107–276 mm SL), Japan.

*Diagnosis*. *Takifugu flavipterus* is distinguished from other species of *Takifugu* by the following combination of characters: the dorsal surface of head and body covered with spinules, extending from the nasal organs to caudal-fin base; the ventral surface of head and ventrum covered with spinules, extending just posterior to the lower jaw to slightly anterior to the anus; spinules also distributed in front of gill opening, connecting the spinuled areas on the dorsum and ventrum; dorsal-fin rays 11 (11–13); anal-fin rays

Fig. 7. Alizarin-red stained paratype (NSMT-P 127419, 149 mm SL) of *Takifugu flavipterus* sp. nov.

Fig. 8. Underwater photograph of *Takifugu flavipterus* sp. nov. (7 cm TL). Japan, Suruga Bay, west coast of Izu Peninsula, Koganezaki Point, 15 m depth. Photograph by Keido Uchino.

Fig. 9. Paratypes of *Takifugu flavipterus* sp. nov. RMNH 31693, 62.1–107 mm SL, Japan. Photograph by Ronald de Ruiter.

10 (10–12); pectoral-fin rays 16 (15–17); vertebrae 8 + 13 = 21; the dorsal half of head and body brown with rounded white spots, many of the spots equal in size to pupil; a longitudinal pale yellow stripe coursing along the ventrolateral edge from chin to the caudal-fin base; five (six) wide dark brown bars crossing over the back, first on the interorbital region, second dorsal to gill opening, third dorsal to the posterior part of pectoral fin, fourth on the dorsal-fin base, fifth on the caudal peduncle (sometimes another bar found just anterior to the dorsal-fin origin); no large black blotch on the side dorsal to pectoral fin; all fins yellow.

*Description*. Characters shown in Diagnosis not repeated here. Head length 31.7% SL (28.2–33.8% SL), snout length 14.0% SL (13.0–17.3% SL), snout to dorsal-fin origin 69.4% SL (62.7–70.4% SL), snout to anal-fin origin 66.3% (64.5–70.1% SL), body width at pectoral-fin base 23.4% SL (15.5–30.0% SL), body depth at anal-fin origin 23.6% SL (18.8–23.6% SL), depth of caudal peduncle 9.6% SL (8.3–9.6% SL), length of caudal peduncle 28.4% SL (23.5–29.5% SL), gill opening length 7.8% SL (7.6–11.9% SL), eye diameter 7.0% SL (5.5–9.4% SL), bony interorbital width 9.8% SL (9.2–12.4% SL), snout to anterior edge of nasal organ 9.7% SL (7.5–17.5% SL), posterior edge of nasal organ to anterior edge of eye 4.0% SL (3.9–5.7% SL), length of dorsal-fin base 10.0% SL (8.6–11.4% SL), length of anal-fin base 7.7% SL (7.7–9.5% SL), longest dorsal-fin ray 17.6% SL (17.6–21.5% SL), longest anal-fin ray 17.8% SL (15.9–21.3% SL), longest pectoral-fin ray 16.6% SL (13.6–17.8% SL), caudal-fin length 26.3% SL (23.5–30.1% SL).

Longitudinal skin fold extending along the ventro-lateral edge of the body from chin to the ventral part of caudal peduncle; two openings in nasal organ wide; dorsal and anal fins slightly pointed; pectoral fin rounded; caudal fin slightly rounded.

*Color of fresh specimens* (Fig. 6). The dorsal half of head and body brown with rounded white


Fig. 10. Color illustration of *Tetraodon poecilonotus* by Temminck and Schlegel (1850, pl. 124, fig. II).

spots, highly variable in size; side of head and body below the dorsal end of the pectoral-fin base white with yellowish tinge; ventral surface of head and body white; iris orange.

*Color when alive* (based on underwater photograph, Fig. 8). Similar to fresh specimens, but colors of body and fins lighter and dark brown cross bars more distinct.

*Distribution*. Japan, Korea, China, Taiwan and Far East Russia.

*Etymology*. The specific name, *flavipterus*, refers to the yellow anal fin.

*Remarks*. *Takifugu flavipterus* has long been recognized under the name of *Takifugu poecilonotus* (Temminck and Schlegel, 1850). However, as explained above, Boeseman's (1947) lectotype designation for *Tetraodon poecilonotus* Temminck and Schlegel, 1850, resulted in this species lacking a scientific name and description. Although the original description of *Tetraodon poecilonotus* by Temminck and Schlegel, 1850 includes characters of *Takifugu alboplumbeus* and *T. flavipterus*, their color illustration (Fig. 10) shows that the figured specimen was *T. flavipterus*.

*Takifugu flavipterus* is widely distributed in Japan from Hokkaido southward to Yaku-shima Island in Kagoshima Prefecture. This species has also been reported from Korea, China, Taiwan and Far East Russia (Shen, 1993; Su and Li, 2002; Kim *et al.* 2005; Dyldin *et al.* 2016).

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