

Taxonomic Studies on the Puffers from Japan and Adjacent Regions - Corrigenda and Addenda. Pt. I

Tokiharu ABE

Tokai Regional Fisheries Research Laboratory, and Zool. Inst., Fac. of Sci., Tokyo Univ.

Since the publication in 1952 of the "Concluding remarks" for a series of his papers dealing with the classification of the puffers (*Tetraodontidae*, *Teleostei*) from Japan and adjacent regions, the writer has received by the courtesy of Mr. D. AOKI (Manazuru), Mr. J. BÖHLKE (Stanford Univ.), Dr. W. A. GOSLINE (Univ. of Hawaii), Dr. B. W. HALSTEAD (School of Trop. Prev. Med., Loma Linda, Cal.) Mr. Kintaro SEKINE, his son, Hidekazu SEKINE (Tokyo), Dr. J. L. B. SMITH (Rhodes Univ.), Dr. I. TOMIYAMA (Tokyo Univ.), Dr. A. B. WALKOM Director, Australian Mus.), Dr. G. P. WHITLEY (Australian Mus.) and Mrs. YANAGISHIMA (Kyoto Univ.), some additional old and recent papers as well as additional old and fresh specimens of puffers. Furthermore, he has received from Dr. Carl L. HUBBS (Scripps Inst. Oceanogr.) and Dr. WHITLEY information and kind advices regarding the usage of the generic and subgeneric names of the Japanese puffers, which the writer, so to speak, continued to integrate step by step during 1939-1952 handicapped by lack of not a few important publications and specimens. The aim of the present paper is to correct some of his earlier mistakes and to add records of rare puffers. He takes great pleasure in expressing here his sincere thanks to the lady and gentlemen mentioned above by name for their kindness and cooperation with him.

I. *Amblyrhynchotes* versus *Amblyrhynchotus*

In the last (ABE, 1952) of a series of his papers bearing the general title of "Taxonomic studies on the puffers (*Tetraodontidae*, *Teleostei*) from Japan and adjacent regions", the writer adopted, following FRASER-BRUNNER (1943), the generic name *Amblyrhynchotes* for *Tetraodon honckenii* BLOCH and *Tetraodon hypselogeneion* BLEEKER, and placed *Spheroides tuberculiferus* OGILBY in the genus (ABE, 1950-51 pp. 198, 199; 1952, pp. 38-40).

Recently Dr. WHITLEY has kindly written to the writer pointing out the invalidity of *Amblyrhynchotus* as a generic name for puffers. According to the type-written copy of the relevant pages (pp. 147, 148) of WHITLEY, 1947 ("New sharks and fishes from Western Australia. Pt. 3" in *Australian Zoologist*, xi, pt. 2, pp. 129-150, 1 pl., 3 text-figs.), *Amblyrhynchotus* TROSCHEL (*Arch. Naturg.*, xxii, (2), 1856, p. 88, *ex* BIBRON MS. in DUMÉRIL, *Rev. Mag. Zool.*, (2) vii, 1855, p. 274) is preoccupied by *Amblyrhynchotus* TILESIIUS, 1818, a genus of Crustacea. Upon checking the original paper by TROSCHEL just mentioned, which has recently been seen by the writer through the courtesy of Mrs. YANAGISHIMA, it has been found that TROSCHEL gave the Latin name, *Amblyrhynchotes*, as FRASER-BRUNNER cited. The original paper by DUMÉRIL mentioned above has not been seen by the present writer, but judging from the citations by GÜNTHER (Cat.

fish., viii), and JORDAN (Genera of fish., pt. II), BIBRON gave only the French name, *Amblyrhynchote*.^{*} It seems advisable to adopt the spelling *Amblyrhynchotes* for the puffers for the time being.

2. Subgeneric names *Torafugu* and *Liosarcus* should be replaced by *Fugu* and *Akamefugu* (new subgenus), respectively

Up to 1952, in dealing with the variation in broader as well as in narrower sense of the taxonomic criteria of puffers, the writer used for the sake of convenience several subgeneric names, the majority of which were passingly proposed by him without being accompanied by detailed account of the differences between them and the genera described by predecessors, and tentatively adopted the generic name *Sphoeroides* for the majority of the common Sino-Japanese puffers following earlier writers. It was a mistake of the present writer that he still pretended to adopt the subgeneric name *Torafugu*** after the introduction in 1952 of the new generic name *Fugu*, with *Tetraodon rubripes* TEMMINCK *et* SCHLEGEL as type. *Torafugu* should be erased and replaced by the subgeneric name *Fugu*.

The adoption by the present writer of the subgeneric name *Liosarcus* for *Tetrodon* (*Liosaccus*) *chrysops* HILGENDORF was also due to a mistake; up to 1952 the writer could not see in the original the paper by HILGENDORF (1879) in which *chrysops* was first described, and thought, following the misspelling in Zoological Record (1879), that HILGENDORF adopted *Liosarcus* as the subgeneric name for the species. Recently Mr. BÖHLKE has kindly sent the writer a type-written copy of the paper by HILGENDORF (1897), in which the subgeneric name is spelled as *Liosaccus*†. The latter name was introduced by GÜNTHER in 1870 for *cutaneus*. It is now evident that the name *Liosarcus* mentioned in the 17th line of p. 93, ABE, 1949b, and elsewhere in a series of the papers by the present writer are all on the erroneous basis.

As pointed out by him (1942, 1949b, 1952) and KURONUMA (1943), *chrysops* is a well-separated species among the genus *Fugu*, and the writer proposes here a new subgeneric name *Akamefugu* for *Tetrodon chrysops* HILGENDORF alone. Its characteristics are described on p. 93 of ABE, 1949b.

3. *Tetraodon alboreticulatus* TANAKA may be distinct from *Tetraodon stellatus* BLOCH *et* SCHNEIDER

The writer has long been of the opinion that *Tetraodon alboreticulatus* TANAKA is a synonym of *Tetraodon stellatus* BLOCH *et* SCHNEIDER without having examined fresh examples of the former species. On July 17, 1953, an adult male of *alboreticulatus* was

* After this paper went to press, Mr. G. PALMER (Brit. Mus.) has kindly checked on DUMÉRIE's paper mentioned above, and found that the spelling was the French *Amblyrhynchote*. The present writer wishes here to express his sincere thanks to Mr. PALMER for his kindness.

** This name was passingly proposed in 1939 for a group of the common Sino-Japanese puffers including *Tetraodon rubripes* TEMMINCK *et* SCHLEGEL and its close allies. So far as the writer is aware, the name *Torafugu* has never been recorded in Zoological Record.

† Mr. BÖHLKE has kindly re-examined the spelling in the original paper in compliance with the writer's request.

shipped to Central Wholesale Market of Tokyo from off Fukushima or Ibaragi Prefecture north of Tokyo), and has been received by the writer from Mr. K. SEKINE and his son, Mr. H. SEKINE, who handle progies and other delicate fishes at the market. In addition, an adult female of this extremely rare puffer was taken by a trap net at Manazuru, Sagami Bay, in the middle of March, 1954, and has been received by the writer from Mr. D. AOKI, clerk at the fish market of Manazuru. Further, while refitting the type specimens described by Dr. TANAKA among the collection of fishes at the Zoological Institute, Faculty of Science, Tokyo University, the writer has re-examined an old mounted specimen of *T. alboreticulatus*, which he formerly regarded as conspecific with *stellatus*. The specimen lacks catalogue number, but upon clearing up some uncertainties in the original description by Dr. TANAKA, the writer has been led to the belief that it is the type.

i. *Uncertainties in the original description of Tetraodon alboreticulatus.* On p. 43 of TANAKA, 1908, the length of the body (to caudal base) of the mounted type specimen of *Tetraodon alboreticulatus* is given as 53.0 cm, and on p. 44 of the paper the length of body exclusive of caudal fin of the same specimen before it was skinned is given as 39.0 cm. This is thought to be in an error; the adoption of cm as a unit by the Japanese people at that time was probably for scientific purposes only*, and it seems probable that mistakes in reading scales crept in. The mounted specimen of *T. alboreticulatus* recently re-examined bears no label, and the dorsal fin is missing, but the measurements agree fairly well with the original description of the type specimen with the exception of the length of body. Further, the specimen well agrees with the photograph of the type specimen (TANAKA, 1908, pl. 1, fig. 5) even to the contour of the caudal, pectoral and anal fins. Although the coloration is difficult to see exactly because of the fungi covering the skin, the writer now believes that the specimen is the type of *T. alboreticulatus*. The measurements made by the writer are given below: Total length ca. 555 mm, standard length 480 mm, length of head ca. 145 mm, depth of body 185 mm, least depth of caudal peduncle 60 mm, diameter of eye 18 mm, interorbital breadth (above centers of orbits) 81 mm, length of snout 88 mm, height of anal fin 65 mm, length of the longest pectoral fin-ray 55 mm. A. 11; P. 18 on both sides.

ii. *Notes on the fresh adult male of T. alboreticulatus from off Fukushima or Ibaragi Prefecture (Cat. No. 48325, Zool. Inst., Fac. Sci., Tokyo Univ.) (pl. I).* The fresh adult male of *T. alboreticulatus* mentioned above is believed to be the third** to be recorded of this extremely rare puffer. The present specimen measures 518 mm in total length,

* They were familiar with the Japanese units, shaku and sun, or inch up to about 1925. There is another situation causing mistakes in reading scales; the Japanese people usually use scales made of bamboo wood bearing the reading up to 30 cm, and for length larger than 30 cm some mistakes in reading scales may occur.

** The second record of *T. alboreticulatus* was published by Dr. TANAKA, 1915. The specimen (Cat. No. 4186, Zool. Inst., Fac. Sci. Tokyo Univ.) described and figured by him has not been located so far by the present writer. It measured 472 mm in total length, and was shipped from the southern part of Bōsō Peninsula (south-east of Tokyo).

424 mm in standard length; length of head is 138 mm, depth of body 180 mm, least depth of caudal peduncle 64 mm, horizontal diameter of eye 13 mm (left) or 15 mm (right), length of snout 88 mm, interorbital breadth (above centers of orbits) 87 mm, bony interorbital breadth (above centers orbits) 71 mm, length of longest dorsal fin-ray 77 mm, length of longest anal fin-ray 59 mm, length of longest caudal fin-ray 88 mm, length of base of dorsal 35 mm, length of base of anal 34 mm, length of base of pectoral 41 mm. D. 11 (=i+10); A. 11 (=i+10); P. 20* (=ii**+18) (on both sides). It mostly agrees with the original description by Dr. TANAKA in coloration and many of the other external characters. The ground color is bulish grey above, and pinckish below. The interspaces between the black spots on the dorsal part of body are very narrow. The dorsal fin is brownish, with black spots. The avove description is made prior to preservation in formalin. The only differences are the number of the pectoral fin-rays, less conspicuous black blotch at the corner of mouth in the present specimen and the absence of "a sereies of three spots larger than eye" on sides of head in this specimen.

iii. *Notes on the fresh adult female of T. alboreticulatus from Manazuru.* The fresh adult female of *T. alboreticulatus* mentioned above measures 505 mm in total length, and 410 mm in standard length. The ovaries are elastic sacs, and the fish seems to have just spawned. According to Mr. AOKI who collected it, its coloration was rather different from the fresh adult male mentioned above; the lower side of the head was yellowish, and the belly was rather blackish when the fish was brought in to the market some 30 minutes after the catch. When the writer examined the specimen after it had been in an ice box for a few weeks, the lower side of the body was pale brownish-pink, or rather whitish; sides of head and trunk light brownish violet; the chin dark brownish violet; the dorsal parts of head and trunk dotted with black spots, their interspaces being very narrow and whitish. The caudal fin was dotted with black spots surrounded by whitish rings; the ground color of the membranes between fin-rays much lighter. The dorsal fin was yellowish brown, with blackish spots. The anal fin was blackish with but a two small black spots. The pectoral fin was light yellowish brown, the fin-rays being much darker; there were three rounded black spots on the anterior surface of the pectoral fin near the insertion, and five much larger black blotches on the posterior surface of the pectoral near the base, of which two were the largest and extended on the flank. The large black blotch at the upper angle of the gill-opening was kidney-shaped and larger than the eye. There was a large black blotch below the angle of the mouth and another around the vent. The floor of the buccal cavity was blackish as in the male. The nasal tentacles were black, only the posterior surface of the uper tentacle being lighter. D. 11 (= i+10). A. 11 (= i+10). P. 19 (=ii+17) (left), and 18 (=ii+16) (right). The air-bladder is bilobed as in the male mentioned above. The liver is very large, lying on the right side of the body as in the male.

* This number is higher than in the specimen first described by Dr. TANAKA.

** The uppermost fin-ray is short; its length is about $\frac{1}{3}$ ~ $\frac{1}{4}$ of the length of the 2nd fin-ray.

iv. *T. alboreticulatus* and *T. stellatus* are closely allied to one another. While the young of *T. stellatus*, which differ greatly in coloration from the adult, are not very rare in Japanese waters, its adult, like *T. alboreticulatus*, are extremely rare. In the absence of skeletonized specimen of *alboreticulatus*, the writer has not been able to compare these species with one another in detail, but the coloration, a good taxonomic criterion in the so-called *Tetraodon*, differs considerably between them; in the adult of *alboreticulatus* the interspaces between the black spots on the dorsal part of body are much narrower than in *stellatus*. It is worth mentioning that the coloration of *alboreticulatus* differs between the sexes, although the adult of the both sexes retain the characteristic markings on the dorsal part of body. Speaking generally, the male has bluish tint above, whereas the female has brownish tint above, and the black spots extend more downwards in the male; there are black spots on the ventral side of caudal peduncle in the male. The blackish spots below the pectoral base are angular and much larger in the male of *alboreticulatus* than in *stellatus*; in the adult female of the former there are no black spots below the pectoral base. The anal fin in the male has blackish spots which are surrounded by bluish grey rings, while this fin in the female is much darker and bears but a few black spots. In view of the variability of coloration (cf. TANAKA, 1908, 1915) and absence of sufficient material, it seems not advisable to lay stress on the secondary sexual characters of *alboreticulatus*. The writer wishes to see the coloration of additional fresh examples of this species and *stellatus*.

In an adult example of *stellatus* taken in 1937 near the Palau (or Pelew) Is., each of the pair of the nasal tentacles differs in size considerable from one another, the anterior one being much smaller, whereas in *alboreticulatus* the difference is not so marked.

Despite such differences as those mentioned above, the fin-ray counts and the coloration of vent, angle of mouth and floor of buccal cavity are alike in the both forms, and here the writer tentatively retains the name *alboreticulatus* as distinct from *stellatus*.

4. Additional records of *Boesemanichthys firmamentum*

Since the publication of "Notes on *Boesemanichthys firmamentum* (TEMMINCK *et* SCHLEGEL), *Tetraodontidae*, *Teleostei*" in 1952, the following examples of this singular puffer have been examined by the writer:

Number of specimens	Locality	Date of catching	Total length	Remarks
1	Near Amanohashidate (west of Mizuru) Japan Sea	Winter, 1951	165 mm	Mounted specimen. Purchased at a souvenir-shop. According to the information by the keeper of the shop, some 30 examples of about the same size were caught there
1	Jogashima, near Misaki	Nov. 1, 1952	ca. 270 mm	Taken by "Fukuroami," a kind of trap-net
3	"	Nov. 11-15 1952	300-360 mm	"
1	Hachijo I.	Probably 1953	ca. 180 mm	
1	Probably Suruga Bay	Probably 1930-1937	63.0 mm	
1	Japan	Prior to 1934	44.7 mm	

The last two examples listed above are identified as the young of *firmamentum* with some doubt, and it is thought better to give measurements in detail. The larger specimen; 63.0 mm in total length, bears the catalogue number 48320 (Zool. Inst., Fac. Sci., Tokyo Univ.), and the smaller one, measuring 44.7 mm in total length, bears the catalogue number 48319 (Zool. Inst., Fac. Sci., Tokyo Univ.). The measurements are as follows :

	Cat. No. 48320 (fig. 1)	Cat. No. 48319
Total length (mm)	63.0	44.7
Standard length (mm)	50.5	35.0
Length of head (mm)	19.0	16.8
Depth of body (at gill-opening) (mm)	ca. 25.5	ca. 17.5
Breadth of body (at posterior end of appressed pectoral fin) (mm)	ca. 18.0	ca. 13.8
Least depth of caudal peduncle (mm)	4.0	2.9
Diameter of eye (horizontal) (mm)	4.8	4.1
Diameter of eye (vertical) (mm)	4.3	3.8
Length of snout (mm)	8.0	6.8
Interorbital breadth (not bony interorbital; above centers of orbits) (mm)	9.5	8.0
Length of longest dorsal fin-ray (mm)	8.5	6.5
" anal " "	9.0	7.7
" pectoral " "	7.9	6.1
" caudal " "	10.7	ca. 9.0
Length of base of dorsal fin (mm)	6.7	3.3
" anal " "	6.5	4.3
" pectoral " "	5.0	4.0
D	15*	14
A	14**	15
P	16† (on both sides)	16† (on both sides)
C	i/4/5/i ††	i/4/5/i ††

* The anteriormost 4 fin-rays are unbranched, although they are long.

** The anteriormost 3 fin-rays are unbranched, although they are long.

† The uppermost fin-ray is unbranched; its length is about $\frac{1}{2}$ of the length of the 2nd fin-ray.

†† The uppermost and lowermost fin-rays are much shorter than the other fin-rays.

The nasal organ on each side of snout is rather large, composed of a pair of broad lobes which are connected basally with one another forming a cup. The body is covered with distinct spines, leaving the hindmost and ventral parts naked. The color in formalin solution is brownish above with pale spots, and the belly is whitish with large rounded or oblong or angular black blotches. All the fins are simply pale.

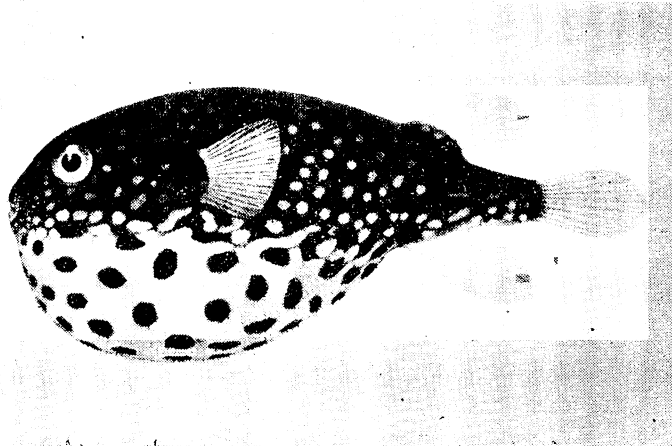


Fig. 1. A young example of *Boesemanichthys firmamentum* TEMMINCK *et* SCHLEGEL (Cat. No. 48320, Zool. Inst., Fac. Sci., Tokyo Univ.). Total length 63.0 mm. Figure by M. SHIRAO.

If these two small examples represent a new species, the writer wishes to designate the larger specimen (Cat. No. 48320, Z. I.) as the type.

5. A tentative list of the puffers of Japan

Leaving the studies on the nomenclature of the so-called *Tetraodon* for future work, the writer presents below a tentative list of the puffers of Japan.

1. *Canthigaster valentini* (BLEEKER) Shima-kinchaku-fugu
2. *C. amboinensis* (BLEEKER)
3. *C. jactator* (JENKINS) Gobanfugu
4. *C. rivulata* (TEMMINCK *et* SCHLEGEL) Kitamakura
5. *Liosaccus cuatneus* (GÜNSHER) Yorito-fugu; Kawa-fugu; Mizu-fugu
6. *Lagocephalus lagocephalus oceanicus* JORDAN *et* EVERMANN Kumasaka-fugu
7. *L. lunaris* (BLOCH *et* SCHEIDER) Saba-fugu; Kin-fugu
8. *L. laevigatus inermis* (TEMMINCK *et* SCHLEGEL) Kana-fugu
9. *Pleuranacanthus sceleratus* (GMELIN) Sen-nin-fugu
10. *Amblyrhynchotes hypselogeneion* (BLEEKER) Shippo-fugu
11. *Fugu (Fugu) rubripes* (TEMMINCK *et* SCHLEGEL) Tora-fugu
12. *F. (F.) chinensis* (ABE) Karasu; Gatora
13. *F. (F.) xanthopterus* (TEMMINCK *et* SCHLEGEL) Shima-fugu
14. *F. (F.) niphobles* (JORDAN *et* SNYDER) Kusa-fugu

15. *F. (Shosai-fugu) vermicularis vermicularis* (TEMMINCK *et* SCHLEGEL) Shōsai-fugu
16. *F. (S.) vermicularis radiatus* (ABE) Nashi-fugu
17. *F. (S.) vermicularis porphyreus* (TEMMINCK *et* SCHLEGEL) Namera-fugu
18. *F. (S.) stictonotus* (TEMMINCK *et* SCHLEGEL) Goma-fugu
19. *F. (S.) poecilnotus* (TEMMINCK *et* SCHLEGEL) Komon-fugu
20. *F. (S.) exascurus* (JORDAN *et* SNYDER) Mushi-fugu
21. *F. (Higan-fugu) pardalis* (TEMMINCK *et* SCHLEGEL) Higan-fugu
22. *F. (Akame-fugu) chrysops* (HILGENDORF) Akame-fugu
23. *Boesemanichthys firmamentum* (TEMMINCK *et* SCHLEGEL) Hoshi-fugu
24. *Tetraodon hispidus* LINNAEUS Sazanami-fugu (young); Yokoshima-fugu adult)
25. *T. nigropunctatus* BLOCH *et* SCHNEIDER Kokuten-fugu
26. *T. stellatus* BLOCH *et* SCHNEIDER Moyō-fugu
27. *T. alboreticulatus* TANAKA Shiroami-fugu

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Explanation of pl. I

A fresh adult male (Cat. No. 48325, Zool. Inst., Fac. Sci., Tokyo Univ.) of *Tetraodon alboreticulatus* TANAKA. See pp. 123-124. Figure by M. SHIRAO.

PLATE I

