



## Taxonomic review of the genera *Balistoides*, *Pseudobalistes* and *Parabalistes* of the family Balistidae with redescription of species occurring in Indian Seas

SATISH SAHAYAK, K. K. JOSHI\* AND V. SRIRAMACHANDRA MURTY\*

Ornamental Fish Division, Marine Products Export Development Authority, Chennai - 600 040  
Tamil Nadu, India

\*Central Marine Fisheries Research Institute, Kochi - 682 018, Kerala, India

e-mail: joshyguru@gmail.com

### Abstract

Fish samples under the the three genera *Balistoides*, *Pseudobalistes* and *Parabalistes* of the family Balistidae were collected from Kalpeni, Minicoy and Agatti islands of Lakshadweep seas and also from Tuticorin, Keelakarai and Mandapam along the south-east-coast of India during 2000-2002. The studies on these three genera revealed variation of colour pattern in fishes collected from south-east coast as well as from Minicoy. *Parabalistes* Bleeker, 1866 which was earlier considered to be a synonym of genus *Pseudobalistes* has been resurrected as a valid genus. Two species of genus *Balistoides* and one species each of *Pseudobalistes* and *Parabalistes* reported and redescribed in the present study from the Indian seas are *Balistoides viridescens* (Bloch and Schneider, 1801), *Balistoides conspicillum* (Bloch and Schneider, 1801), *Pseudobalistes flavimarginatus* (Ruppell, 1828) and *Parabalistes fuscus* (Bloch and Schneider, 1801).

Keywords: *Balistoides*, Colour variation, Morphology, *Parabalistes*, *Pseudobalistes*, Trigger fishes

### Introduction

Fisheries resources being renewable, managing them on a sound scientific basis is essential to harvest maximum sustainable economic yields on a continual basis. The basis for such a management is knowledge of the dynamics of every species that contribute to the fishery. Tropical seas unlike their counterparts in the temperate regions, are inhabited by a large number of species (Joshi *et al.*, 2012; Satish *et al.*, 2013). In many cases, the species live together sharing the same habitat and food. Many families are represented by several genera and several closely resembling species and any non-selective (or the least selective) gear exploits a large number of species in one haul. A sound knowledge of the taxonomy of fishes contributing to the fishery and the capability to identify them to species level therefore plays a vital role (Abraham *et al.*, 2011). Fishes of the family Balistidae do not form a major fishery anywhere in India and were not used for human consumption until recently. As the major interest in research has been on the commercially important fishes, no significant research effort has been paid to any aspect of these fishes.

Family Balistidae is represented by twelve valid genera (Matsuura, 1980; 2001; 2009). It is interesting to note that three genera *Balistoides*, *Pseudobalistes* and *Parabalistes* showed similarities and several authors made confusing descriptions and resulted in serious nomenclature issues. The subgenus *Pseudobalistes* designated by Bleeker with *Pseudobalistes viridescens* as the type species (Bleeker, 1866), has been later changed as *Balistoides* by Fraser-Brunner (1935). Another subgenus *Parabalistes* was erected by Bleeker (1866). The present study aims to find the validity of the three genera, *Balistoides*, *Pseudobalistes* and *Parabalistes* and to redescribe the species in the genera from Indian Seas.

### Material and methods

The specimens of the two genera were collected from Kalpeni, Minicoy and Agatti islands of Lashadweep Seas and also from Tuticorin, Keelakerai and Mandapam along the south-east coast of India during 2000-2002. Examination of the specimens from the Museum collections of Zoological Survey of India (ZSI), Kolkata and Museum of the Central Marine Fisheries Research Institute (CMFRI) at Cochin and Mandapam were

done during 2000-2002. The fresh colour and pigmentation of the specimens were recorded at the landing centre and photographs were taken. The specimens from different localities were preserved separately and all relevant meristic and morphometric data were taken following Matsuura (1980; 2009). All the linear measurements were made in the median longitudinal axis as per Hubbs and Lagler (1958). After taking the biometric data, the belly was cut open to note the sex.

Examination of the nasal apertures and the counts of lateral line scales, arrangement and morphology of the scales on the cheek, body, abdomen, caudal peduncle and fin rays counts were made under a binocular stereozoom microscope. Certain body proportions for each species expressed as percentage of standard length and certain proportions in the head expressed as percentage of head length are given in the descriptions. The International Code of Zoological Nomenclature was constantly consulted and when cited in the text it is referred to as Code.

## Results and discussion

### Genus: *Balistoides* Fraser-Brunner, 1935

Type species: *Balistes viridescens* Bloch and Schneider, 1801

Bleeker (1865) published the drawings together with their names *Balistes* (*Pseudobalistes*) *flavimarginatus* as plate CCXVIII Fig. 3 and *Balistes* (*Pseudobalistes*) *viridescens* plate CCXXIV Fig. 3 in *Atlas ichthyologique*. Bleeker (1866) published the description of subgenus *Pseudobalistes* and designated *Pseudobalistes viridescens* Bleeker, 1866, as the type species. The description of *Balistes viridescens* was first published by Bloch and Schneider (1801) and Bleeker's *Pseudobalistes viridescens* is conspecific with this. The monotype is qualified by the fact that part 20 of the Atlas, in which Bleeker also referred *Balistes viridescens* to the new genus *Pseudobalistes*, was not published until 1869. Therefore, Bleeker's late type designation of 1866 is invalid as the publication of part 19 of 1865 supersedes his act, having already established the monotype. Fraser-Brunner

(1935) erected the genus *Balistoides* with the same type species as that of *Pseudobalistes*, hence *Balistoides* Fraser-Brunner, 1935 is valid now (Matsuura, 2009). The original designation of *Balistes viridescens* as type of the then newly erected *Balistoides* by Fraser-Brunner (1935) remains valid and can be continued in naming this valid genus, which is biologically distinct from the genus widely named *Pseudobalistes*.

Two species are reported and redescribed in the present study from the Indian seas: *Balistoides viridescens* (Bloch and Schneider, 1801) and *Balistoides conspicillum* (Bloch and Schneider, 1801)

#### *Balistoides viridescens* (Bloch and Schneider, 1801) (Fig.1a)

*Balistes viridescens* Bloch and Schneider, 1801, p. 477.

*Balistes viridescens* Day, 1878, p. 689.

*Balistoides viridescens* (Bloch and Schneider, 1801) p. 477

*Pseudobalistes viridescens* (Bloch and Schneider, 1801), p. 477

*Balistoides viridescens* Jones and Kumaran, 1980, p. 668, Fig. 569.

**Diagnosis:** Nostrils placed in depression surrounded by spinules, anterior nostril dome shaped with a circular opening at the top; groove before eye. Scales on cheek square at the anterior and rectangular towards the posterior, arranged in 5-6 horizontal rows with fleshy rows in between. Caudal peduncle equally long and deep, laterally elliptical, having spherical protuberances or antorse spines arranged in 4-5 rows. Ventral flap absent and caudal fin round.

**Material examined:** A total of 15 specimens were collected from Kalpeni, Minicoy Lakshadweep Islands, Tuticorin, Keelakarai, Mandapam and Gulf of Mannar.

**Description:** D III, i, 21-26; P. i, 13-14; ventral spines 6-14; A. i, 22-23; C. ii, 10; Gill rakers 30-35; number of scale from origin of second dorsal to base of anal 11-15; lateral line scale 38-49; round the caudal peduncle 10-12.

**As percent of head:** Head height 106.3-128.9 (121.0); head width 43.8-60.8 (53.4); orbit 13.2-35.7 (20.5); interorbital 25.0-33.3 (29.6); postorbital 6.7-18.8 (13.0).

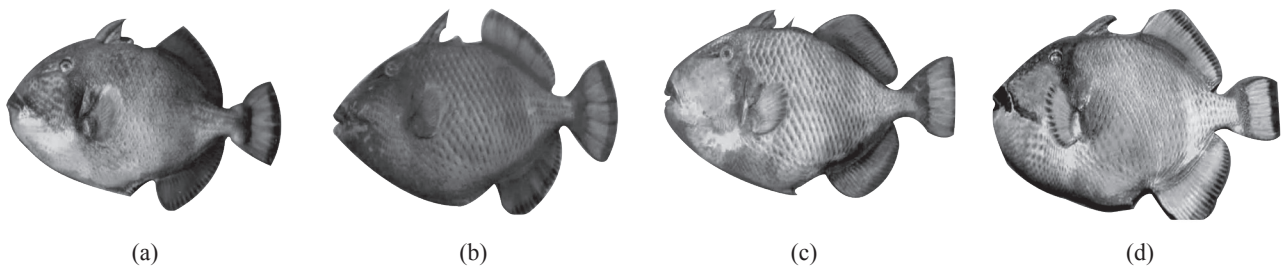


Fig. 1. *Balistoides viridescens* (Bloch and Schneider, 1801 from: a. Mandapam 316 mm TL, b. Keelakarai 326 mm TL, c. Tuticorin 527 mm TL, d. Minicoy 455 mm TL

*As percent of standard length:* Depth 45.8–51.4 (48.9); head 35.4–43.2 (38.5); snout 26.5–29.04 (27.6); predorsal length (I) 33.4–40.5 (36.4); predorsal length (II) 61.5–70.6 (65.8); preanal length 64.8–72.4 (68.0); postdorsal length (I) 35.3–46.4 (41.8); postdorsal length (II) 5.4–8.8 (6.9); base of first dorsal 18.7–29.4 (21.9); base of second dorsal 23.5–31.9 (27.5); base of anal 21.05–28.4 (23.1); second dorsal 11.8–18.1 (15.9); anal 8.8–18.4 (16.01); pectoral 12.6–15.6 (13.8); caudal peduncle 8.1–10.5 (9.3).

Body oval, deep, head profile, convex; inter-orbital straight; lips thick cylindrical, broad, groove longer than orbit, narrow at the anterior, broad and shallow towards posterior with some minute sharp protuberances. First dorsal spine with small protuberances, third spine less than  $\frac{1}{4}$  length of first spine. A thick “C” shaped flap covers the circular opening of anterior nostrils (Fig. 2a). The first teeth of the upper jaw conical with pointed tip diverging outside. The first teeth of the lower jaw conical with pointed tip, other teeth are conical with a broad base (Fig. 2b).

Few scales arranged just above the base of pectoral are small, round and engraved. Gill opening oblique, gill rakers are elongated, hyaline, pointed and laterally compressed (Fig. 2c). The second dorsal and anal fins are anteriorly elevated and posteriorly round having serrated edge and pectoral fin round.

Square and rectangular scales on cheek have spherical protuberances arranged in 4-6 vertical rows (Fig. 2d). Body scales have vertical rows of spherical protuberances

arranged in 4-9 rows. Fresh specimens have a dark central blotch (Fig. 2e). The ultrastructure of the anterior margin of the body scale has irregular shaped projections and long ridges and the posterior margin has round protuberances. Rectangular and rhomboid scales on abdomen have spherical protuberances arranged in oblique rows (Fig. 2f). There are two types of scales on caudal peduncle i) scales with 4-6 rows of spherical protuberances, ii) scales with a large spherical protuberance or antrose spine at the anterior middle of the scales with 3-5 vertical rows of spherical protuberance (Fig. 2g). The ventral flap is absent, ventral spines are transparent, elongate, thick and blunt in adults, the spines are thick, short and hyaline having pointed tips in juveniles (Fig. 2h). Pelvic spine is movable, club shaped fully decorated with hyaline spinules, edges are stellate.

*Colour:* Variations in colour pattern (fresh specimens) were observed in specimens collected from Keelakarai, Mandapam, Tuticorin and Minicoy (Fig. 1a-d). Body olive green, body scales with dark green patch at the centre (Keelakarai), yellow, body scales with a dark brown patch at the centre (Mandapam), yellow; body scales brown-green colour at the centre (Tuticorin, Minicoy). Cheek orange, with black and white band above upper lips (Keelakarai), bright yellow, just above upper lip reddish brown, pink and black band (Mandapam), orange, just at the edge of the mouth greenish yellow band, upper lip brown, lower lip pink (Tuticorin) yellow, upper lip black, lower lip pink just above upper lip a white, black and a narrow white (Minicoy) band. First dorsal fin orange (Keelakarai) brown, with a pink (Mandapam), brown

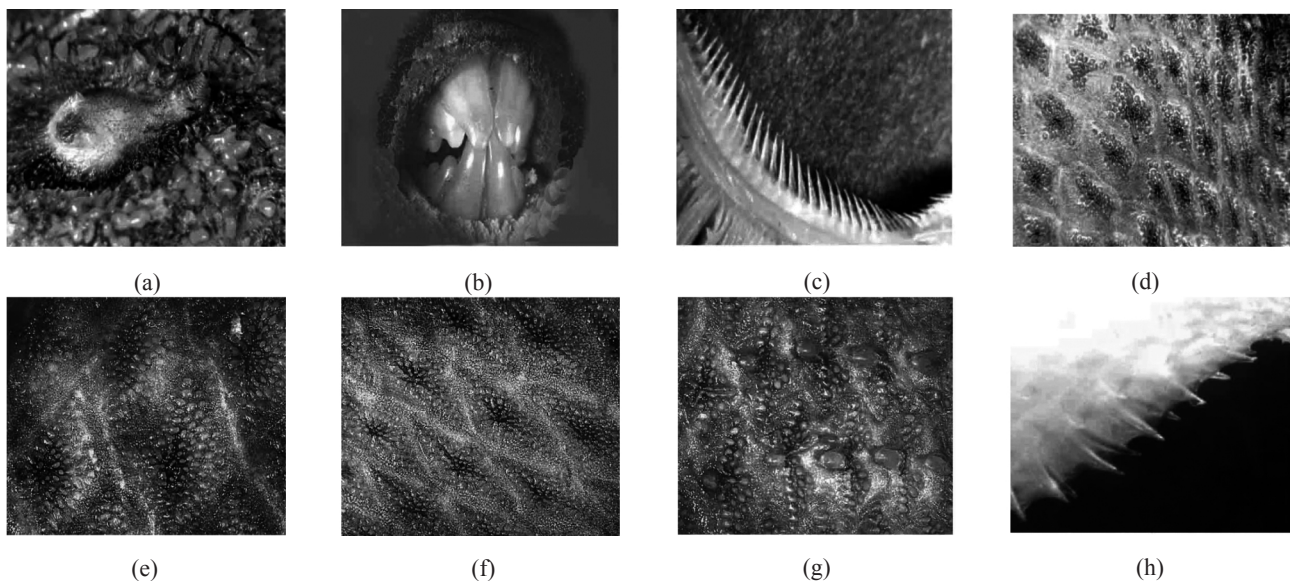


Fig. 2. *Balistoides viridescens* (Bloch and Schneider, 1801). a. Nasal apertures, b. Teeth, c. Gill rakers, d. Scales on cheek, e. Body scales, f. Scales on abdomen, g. Scales on caudal peduncle, h. Ventral spines

(Tuticorin) or yellow (Minicoy) patch at the base. Caudal fin orange, bordered with black band, pectoral fin orange (Keelakarai), yellow (Mandapam) yellow, with dark brown band at edges (Tuticorin) yellow, with black band at edges (Minicoy).

*Colour of the preserved specimens:* Body brown, body scale with a black blotch at the centre. Longitudinal blotch from inter-orbital to base of pectoral.

*Distribution :* Mauritius, New Guinea, Red sea, Zanzibar, Maldives, Solomon Islands, Fiji, Japan, Taiwan, India

*Remarks:* The means of % SL with other morphometric parameters are given in parentheses following the range for each proportion, as such studies facilitate comparing and differentiating between closely resembling species of a genus (Abraham *et al.*, 2011) and in comparison of the stocks of the same species from different localities (Lachner and Jenkins, 1971). The fishes collected from Keelakarai, Mandapam, Tuticorin and Minicoy islands, showed variations in the colour pattern. These fishes were very rare in the catches and only 27 specimens could be collected during the study period.

***Balistoides conspicillum* (Bloch and Schneider, 1801) (Fig. 3)**

*Balistes conspicillum* Bloch and Schneider, 1801, p. 474.

*Pseudobalsites conspicillum* (Bloch and Schneider, 1801), p. 474.

*Balistes conspicillum* Day, 1878, p. 689.

*Balistoides conspicillum* Jones and Kumaran, 1980, p. 670, Fig. 570.

*Diagnosis:* Nostrils in a shallow depression, anterior nostril conical with a circular opening at the top; groove before eye. Scales on cheek diamond shaped, obliquely arranged at the anterior and vertically arranged posteriorly. Body scales with spherical protuberances. Caudal peduncle equally deep and long cylindrical, having two rows of spherical protuberances; ventral flap absent and caudal round.



Fig. 3. *Balistoides conspicillum* (Bloch and Schneider, 1801) from Lakshadweep, 282 mm TL

*Material examined:* One specimen from Lakshadweep, CMFRI. Reg.No. CMFRI-LA-F-154/476, of length of 282 mm TL (Fig. 3).

*Description:* D. III, i, 25; P. i, 13; ventral spines 20; A. i, 21; C. ii, 10; number of scales from origin of second dorsal to base of anal 21; lateral line scales 57; round the caudal peduncle 11.

*As percent of head:* Head height 135.9; head width 59.0; orbit 18.0; Interorbital 32.05; postorbital 6.4; length of first spine 64.1.

*As percent of standard length:* Depth 40.5; head 33.6; snout 25.4; predorsal length (I) 33.1; predorsal length (II) 66.8; preanal length 76.3; postdorsal length (I) 44.8; postdorsal length (II) 4.3; base of first dorsal 22.0; base of second dorsal 29.0; base of anal 19.4; second dorsal 9.9; anal 9.5; pectoral 9.5; caudal peduncle 7.3.

Body oval, head profile dorsally concave, ventrally convex; lips thick, cylindrical. Eye placed high, inter-orbital straight. Groove equal to orbit, narrow towards the anterior, broader and deep towards the posterior, parallel to head profile. First dorsal spine broad, blunt, with small protuberances at the anterior portion. Third spine, less than  $\frac{1}{4}$  the length of first spine. Opening of the anterior nostril covered by a “C” shaped thick flap.

Rectangular scales placed in a rectangular area just above pectoral base; gill opening vertical. Second dorsal and anal fins, have a convex profile. The length of anal fin base is half to that of second dorsal fin base; both the fins are translucent. Pectoral fin round. Scales on cheek have 3–4 vertical rows of round protuberances (Fig. 4a). Body scales with a spherical pointed protuberance at the anterior middle and 4–6 vertical rows of round protuberances (Fig. 4b). Scales on abdomen rectangular or rhomboid arranged in oblique rows with round protuberances also arranged in oblique rows (Fig. 4c). Scales on caudal peduncle are of two types i) scales with a large spherical protuberance at the anterior middle of the scale and round protuberances, ii) scales with round protuberances arranged in vertical rows (Fig. 4d,e). Ventral spines 20 in number arranged in a single row with the spines from either side alternating. Each spine is a triangular projection arising from the lateral side of an elongated rectangular scale. Rudimentary pelvic spine short and stout, has minute spinules.

*Colour:* Formalin preserved fish, dark brown, lips pink, behind lips pink followed by a circular whitish-brown ring. Whitish-brown band below eye, first dorsal fin black, second dorsal and anal fin pink and translucent; caudal brown edge blackish-brown. Ventrally 6–7 circular to

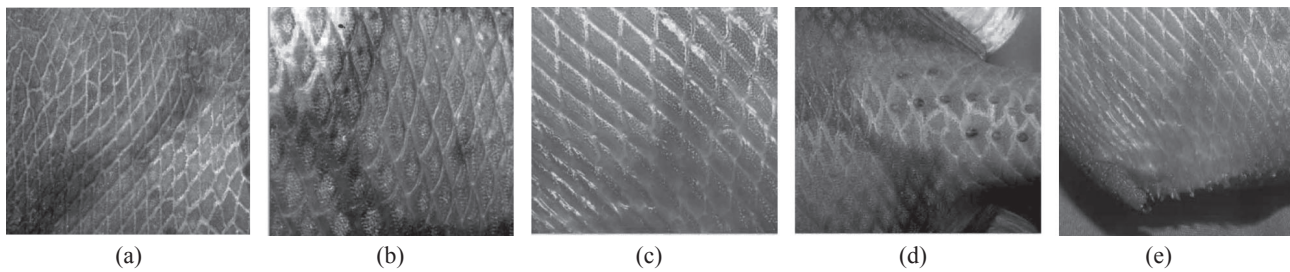


Fig. 4. *Balistoides conspicillum* (Bloch and Schneider, 1801). a. Scales on cheek, b. Body scales, c. Scales on abdomen, d. Scales on caudal peduncle, e. Ventral spines

hexagonal whitish-brown patches arranged in three rows. Caudal peduncle has broad whitish-brown streak (Fig. 3).

*Distribution:* Indian Seas, New Guinea, Japan, Singapore, Philippines, Marshall Island, Maldives, Andaman, India.

**Genus: *Pseudobalistes* Bleeker, 1865**

Type species: *Balistes flavimarginatus* Ruppell, 1829, pl. 218

*Pseudobalistes flavimarginatus* (Ruppell, 1828) (Fig. 5a)

*Balistes flavimarginatus* Ruppell, 1828, p. 33.

*Balistes flavimarginatus* Day, 1878, p. 690

*Pseudobalistes flavimarginatus* (Ruppell, 1828), p. 33.

***Pseudobalistes flavimarginatus* Jones and Kumaran, 1980, p. 671, Fig. 571.**

*Diagnosis:* Anterior nostril in a depression, dome shaped with a circular opening at the top, Groove before eye. Scales on cheek absent anteriorly, posteriorly square, arranged horizontally in 5-6 narrow rows with fleshy rows in between. Body scales with spherical protuberances.

Caudal peduncle longer than deep with 4-5 rows of sharp ridge or blunt spherical protuberances. Caudal truncate with lobes produced.

*Material examined:* A total of 14 specimens were collected and studied from Minicoy, Agatti, Tuticorin, and Andaman.

*Description:* D. III, i, 24-25; P. i, 13-14; ventral spines 8-13; A. i, 23-24; C. ii, 10; Gill rakers 29-31; number of scales from origin of second dorsal to base of anal 12-14; lateral line scales 44-51; round the caudal peduncle 10-11.

*As percent of head:* Head height 129.5–141.3 (134.3); head width 52.6–55.4 (54.1); orbit 16.1–23.08 (18.6); interorbital 33.3–35.8 (34.2); postorbital 11.1–14.4 (12.9).

*As percent of standard length:* Depth 50.9–53.3 (52.4); head 35.4–37.1 (36.3); snout 27.6–29.4 (28.4); predorsal length (I) 31.5–36.7 (34.1); predorsal length (II) 60.06–65.2 (63.03); preanal length 64.3–66.3 (65.3); postdorsal length (I) 42.7–47.1 (44.5); postdorsal length (II) 3.8–7.5 (6.1); base of first dorsal 18.8–23.6 (21.3); base of second dorsal 29.1–32.5 (30.9); base of anal

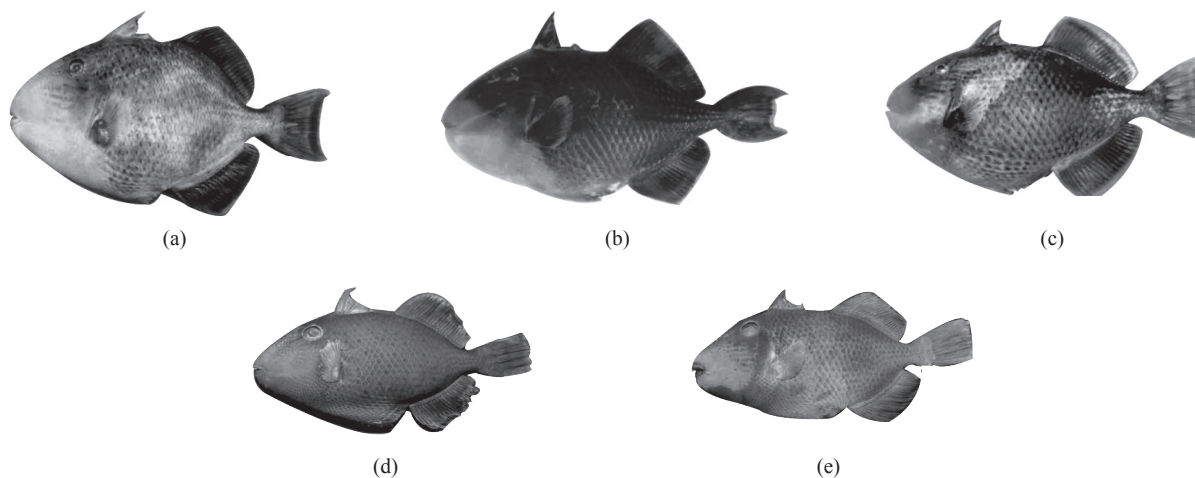


Fig. 5. *Pseudobalistes flavimarginatus* (Ruppell, 1828) from a. Minicoy 435 mm TL, b. Tuticorin 490 mm TL, c. Mandapam 345 mm TL, d. Agatti CMFRI-F.154/443, 317 mm TL, e. Andaman ZSI -2251, 183 mm TL (collected by Dr. Francis Day)

28.3–30.2 (29.02); second dorsal 15.7–19.05 (17.9); anal 16.9–19.9 (18.4); pectoral 13.1–14.6 (14.1); caudal peduncle 9.2–10.1 (9.7);

Body oval, head profile convex; lips broad, thin and narrow at the center. Interorbital convex, groove, straight, equal to orbit, narrow and shallow towards anterior, deep and broad posteriorly. First dorsal spines strong, stout, laterally compressed, broad. Numerous spinules, at the anterior portion with larger spinules at tip. Anterior nostril covered by a “C” shaped flap. Posterior nostril circular and placed slightly elevated from the anterior nostril, (Fig. 6a). The first teeth of the upper and lower jaw conical with pointed tip, tips diverge in case of upper jaw. The other teeth are rectangular, elongated with the upper end conical towards one side (Fig. 6b).

Scales above the pectoral base is arranged in an irregular fashion having round, rectangular and hexagonal shapes. Gill opening vertical, gill rakers are elongated, blunt tipped, laterally flat, with rough inner edge (Fig. 6c). The second dorsal and anal fin is elevated anteriorly and short and rounded posteriorly with a wavy edge, pectoral fin rounded. Scales on the cheek are of two types: i) scales on cheek with 1-4 vertical rows of spherical protuberances with few ridges, ii) scales covered by skin with smooth surface and shallow depressions and ridges (Fig. 6d). Body scales, with a dark blotch at the centre and have 5 – 6 vertical columns of spherical blunt protuberances (Fig. 6e). The ultrastructure of the anterior margin of the body scale has network of fibers and the posterior margin has round protuberances. Scales on abdomen have ridges on the first row followed by 3-5 oblique rows of round

protuberances (Fig. 6f). There are two types of scales on caudal peduncle, i) scales with spherical or sharp ridges at the anterior middle of the scale, ii) scales with spherical protuberance arranged in 3-4 vertical rows (Fig. 6g). The anterior ventral spines are transparent, elongated; posterior spines are broad and pointed (Fig. 6h). The ventral pelvic spine is rectangular and laterally elliptical with large number of blunt protuberances.

*Colour:* Variation in colour pattern (fresh specimens) was observed in specimens collected from Mandapam, Tuticorin and Minicoy (5 a-c). Body grey, upper and lower lips orange, cheek, orange, with dorsally lighter and ventrally darker (Minicoy), dark brown, upper and lower lips pink (Tuticorin), yellow, cheek orange, dorsally lighter and ventrally darker (Mandapam). First dorsal fin brown, second dorsal, anal and caudal fins have red, grey and a narrow orange band at the edge (Minicoy) black, second dorsal, anal and caudal fins have orange and grey band at the edge (Tuticorin), brown, second dorsal, anal and caudal fins have red, grey and narrow orange band at the edge (Mandapam).

*Colour of the preserved specimens:* The whole fish is brown (Fig. 5d,e).

*Distribution:* Red sea, New Guinea, Solomon’s Islands, Philippines, Japan, Taiwan, Australia.

*Remarks:* The fishes collected from Mandapam, Tuticorin and Minicoy showed variations in the colour pattern. These fishes were very rare in the catches and only 14 specimens could be collected during the study period.

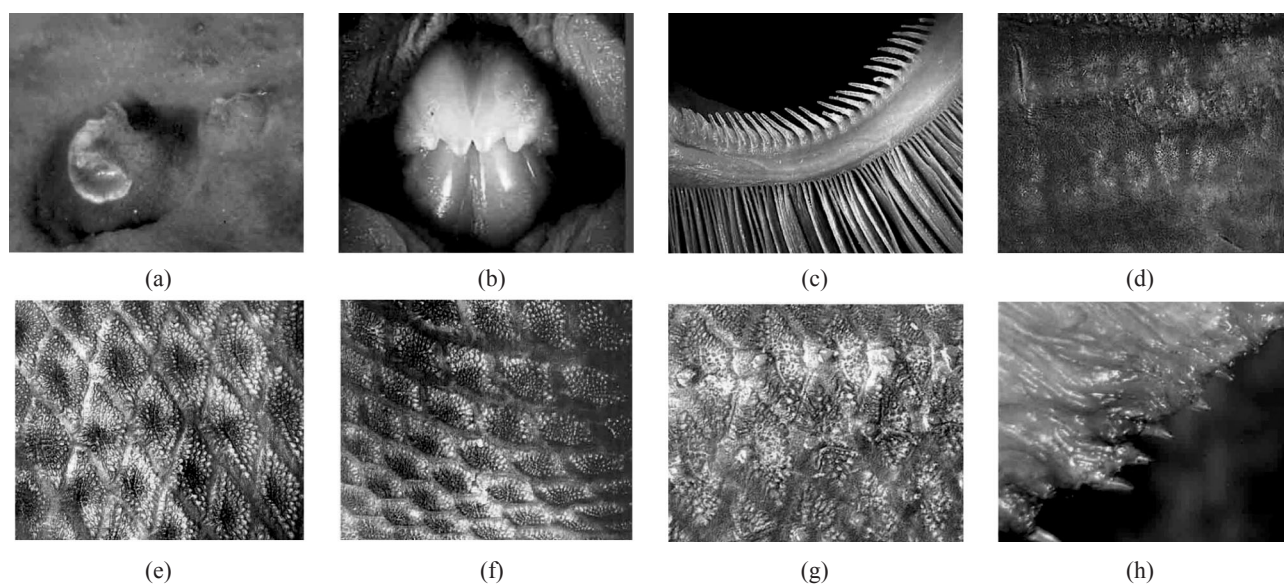


Fig. 6. *Pseudobalistes flavimarginatus* (Ruppell, 1828), a. Nasal apertures, b. Teeth, c. Gill rakers, d. Scales on cheek, e. Body scales, f. Scales on abdomen, g. Scales on caudal peduncle, h. Ventral spines

**Genus: *Parabalistes* Bleeker, 1866**

Type species *Parabalistes chrysospilus* Bleeker, 1866=*Balistes chrysospilus* Bleeker, 1853)

*Parabalistes fuscus* (Bloch and Schneider, 1801) (Fig. 7a)

*Balistes fuscus* Bloch and Schneider, 1801, p. 471.

*Parabalistes fuscus* (Bloch and Schneider, 1801), p. 471.

*Balistes fuscus* Day, 1878, p. 690.

***Pseudobalistes fuscus* (Bloch and Schneider, 1801), p. 471.**

*Material examined*: One specimen from Agatti of 145 mm TL (Fig. 7a) and an additional specimen from south-west coast of India, CMFRI Reg. No. 1025, 362 mm TL (Fig. 7b).

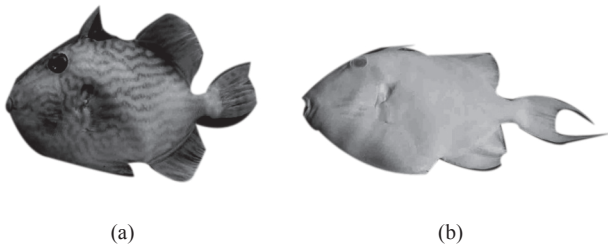


Fig. 7. *Parabalistes fuscus* (Bloch and Schneider, 1801) from a. Agatti, 145 mm TL, b. from south-west coast of India CMFRI- 1025 362 mm TL

*Description*: D. III, i, 25; P. i, 12; Ventral spines 11; A. i, 22; C. ii, 10; number of scales from origin of second dorsal to base of anal 22; Lateral line scales 51; round the caudal peduncle 15.

*As percent of head*: Head height 125; head width 70.5; orbit 25.0; interorbital 27.3; postorbital 6.8.

*As percent of standard length*: Depth 53.04; head 38.3; snout 28.7; predorsal length (I) 35.7; predorsal length (II) 66.1; preanal length 69.6; post dorsal length (I) 39.1; postdorsal length (II) 7.0; base of first dorsal 25.2; base of second dorsal 27.0; base of anal 26.1; second dorsal 22.6; anal 17.4; pectoral fin length 13.0; caudal peduncle 10.4.

Body oval, deep, head profile convex, chin prominent; lips thick, fleshy, broad, and continuous at corner. Interorbital straight, groove, shallow, equal to orbit, directed downwards. First dorsal spine, long, stout, tip pointed. Laterally compressed smooth. Third spine  $\frac{1}{4}$  the length of first spine. Nostrils placed in depression, with a thin translucent "C" shaped flap on the anterior opening (Fig. 8a). The first teeth of the upper jaw conical with the tip pointed and diverging outside. The first teeth of the lower jaw conical with pointed tip. The other teeth are rectangular with conical upper edge (Fig. 8b).

Few large and small scales form a cluster, arranged on a depressed rectangular area above the base of pectoral. Gill opening vertical. The anterior rays of the second dorsal fin and anal fin are long and the posterior rays shortest thus making the fin elevated anteriorly and short posteriorly, fin profile concave. Pectoral fin rounded.

Scales on cheek are of two types: i) scales with round protuberances and ridges arranged in 1- 4 vertical rows, ii) scales of the fleshy rows (covered by skin) have shallow depressions and ridges and smooth surface (Fig. 8c). Body scales with vertical rows of spherical protuberances arranged in 5 - 10 vertical rows, with the anterior most rows having larger protuberances (Fig. 8d). Scales on abdomen rhomboid which are arranged in oblique rows, each scale has ridges on the first row and round protuberances in 3-5 oblique rows (Fig. 8e). Scales on caudal peduncle have

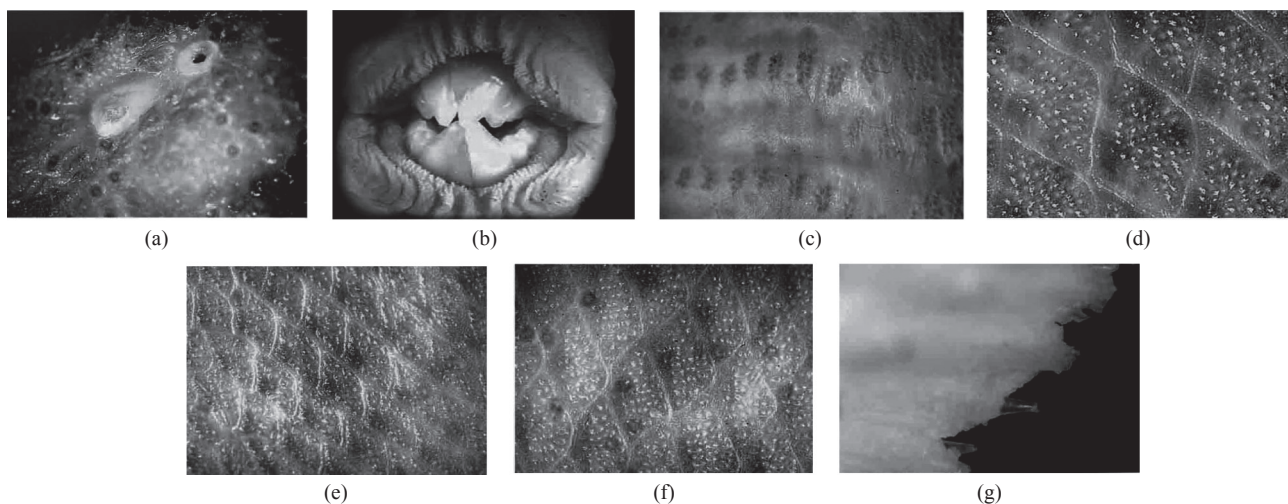


Fig. 8. *Parabalistes fuscus* (Bloch and Schneider, 1801). a. Nasal aperture, b. Teeth, c. Scales on cheek, d. Body scales, e. Scales on abdomen, f. Scales on caudal peduncle, g. Ventral spines

short round blunt protuberances arranged in 3-5 vertical rows (Fig. 8f). Ventral flap, narrow, supported by hyaline spines (Fig. 8g). Rudimentary pelvic spine movable with many pointed and blunt glassy protuberances.

*Colour:* Formalin preserved fish whitish-brown, with horizontal wavy or undulating brown bands. First dorsal fin brown, second dorsal and anal fin whitish-brown with undulating brown bands. Caudal fin whitish-brown with brown vertical bands, pectoral translucent and lips white.

*Distribution:* Red sea, Mauritius, Fiji Island, Ceylon, Japan, India.

*Remarks:* This species was recorded from Agatti Island for the first time (Lakshadweep Archipelago). The subgenus *Parabalistes* was erected by Bleeker (1866) with the following characters: head profile obtuse, convex. rostrum naked, scales arranged in rows with some longitudinal gaps in between on the cheek, longitudinally 45 scales, caudal peduncle without spines, second dorsal and anal elevated anteriorly and angulated, caudal rounded with marginal lobes produced. Herre (1924) mentioned that this genus is not distinctive enough to be considered as a separate genus in the family Balistidae and included *Parabalistes fuscus* in the genus *Balistes* as *Balistes fuscus*. Fraser- Brunner (1935) and Matsuura (1980) treated this subgenus as a synonym of genus *Pseudobalistes*. The characters like scales on cheek which are horizontally arranged, with shallow fleshy groove in between, the soft dorsal and anal are elevated anteriorly and angulated, caudal peduncle without spines and caudal truncate with filamentous rays in the upper and lower lobes make this genus distinct from the other genera of family Balistidae. The species *Balistes fuscus* of Bloch and Schneider (1801) and *Parabalistes chrysospilus* of Bleeker (1866) are synonyms (Herre 1924).

The specimen recorded from the Lakshadweep Archipelago and another specimen at the CMFRI museum, collected from south-west coast of India confirm to the species description with respect to *Balistes fuscus* of Bloch and Schneider (1801) and *Parabalistes chrysospilus* of Bleeker (1866). Some of the distinctive characters of these specimens are used for redefining the genus as: "Anterior nostril ridge-like, with a circular opening at the top. Groove before eye. Scales on cheek absent anteriorly, posteriorly transverse rows of square scales are present with wide fleshy rows. Body scales diamond shaped, having spherical protuberances. Caudal peduncle is short and deep with diamond shaped scales arranged in horizontal rows, with round protuberances. Caudal truncate with filamentous rays on upper and lower lobes". Hence it can be concluded that the *Parabalistes* is a valid genus and monotypic of the family Balistidae.

## Acknowledgements

The authors are grateful to the Director, Central Marine Fisheries Research Institute, Cochin for the encouragement and facilities provided. The authors also wish to express sincere thanks to Dr. K. J. Abraham, and N. Rudramurthy. Authors acknowledge the Centre for Marine Living Resources and Ecology, Ministry of Earth Sciences, Government of India, for the financial support.

## References

- Abraham, K. J., Joshi, K. K. and Sriramachandra Murty, V. 2011. *Taxonomy of the fishes of the family Leiognathidae (Pisces, Teleostei) from the West coast of India*. *Zootaxa*, 2886: 1-18.
- Abraham, K. J., Sriramachandra Murty, V. and Joshi, K. K. 2011. Fishery and population dynamics of silver bellies along the Kerala coast. *Indian J. Fish.*, 58 (2): 15-21.
- Bleeker, P. 1865-69. *Atlas ichthyologique des Indes Orientales Néerlandaises*, publié sous les auspices du Gouvernement colonial néerlandais. Tome V. Baudroies, Ostracions, Gymnodontes, Balistes. p.1-152, pls. 194-231.
- Bleeker, P. 1866. Systema Balistidorum, Ostracionidorum, Gymnodontidorumque revisum. *Neder. Tijdschr. Dierk.*, 3: 8-19.
- Bloch, M. E. and Schneider, J. G. 1801. *Systema Ichthyologiae iconibus cx illustratum. Post obitum auctoris opus inchoatum absolvit, correxit, interpolavit* Jo. Gottlob Schneider, Saxo. Berolini. Sumtibus Austoris Impressum et Bibliopolio Sanderiano Commisum. 1-584, Pls. 1-110.
- Day, F. 1878. *The fishes of India; being a natural history of the fishes known to inhabit the seas and freshwaters of India, Burma, and Ceylon. Fishes of India*, Part 4, William Dawson's, London, 799 pp.
- Fraser-Brunner, A. 1935. Notes on the Plectognath fishes I. A synopsis of the genera of the family Balistidae. *Ann. Mag. Nat. Hist.*, 15 (90): 658-663.
- Herre, A. W. C. T. 1924. Poisonous and worthless fishes. An account of the Philippine Plectognaths. *Philipp. J. Sci.*, 25 (4): 415-510, pls. 1-2.
- Hubbs, C. L. and Lagler, K. F. 1958. Guide to the fishes of the great lakes and tributary waters. *Cranbrook. Inst. Sci. Bull.*, 18: 1-100.

- Jones, S. and Kumaran, M. 1980. Fishes of the Laccadive Archipelago. Mathrubhumi press, Cochin, p. 662-676.
- Joshi, K. K., Abdussamad, E. M., Said Koya, K. P., Prathibha Rohit, Shubhadeep Ghosh, Sreenath, K. R., Beni, M., Bineesh, K. K. and Akhilesh, K. V. 2012. Taxonomy and key for the identification of tuna species exploited from the Indian EEZ. *Indian J. Fish.*, 59(3): 53-60.
- Lecher, E. A. and Jenkins, R. E. 1971. Systematics, distribution, and evolution of the chub genus *Nokomis* Girard (Pisces, Cyprinid) of eastern United States, with descriptions of new species. *Smithson. Contrib. Zool.*, 85: 1-97.
- Matsuura, K. 1980. A revision of Japanese Balistoides fishes. I. Family Balistidae. *Bull. Natl. Sci. Mus. Ser. A. (Zool.)*, 6 (1): 27-69.
- Matsuura, K. 2001. Family Balistidae. In: Carpenter, K. E. and Niem, V. H. (Eds.), Species identification guide for fishery purposes. *The living marine resources of the western central Pacific . Bony fishes part.4 (Labridae- Latimeriidae), estuarine crocodiles, sea turtles, sea snakes and marine mammals.* FAO, Rome, V.6: 3902-3928.
- Matsuura, K. 2009. Species accounts of Scatophagidae, Triacanthidae, Balistidae, Monacanthidae, Ostraciidae, Tetradontidae, Diodontidae. In: Kimura, S. S. U. Satapoomin and Matsuura, K. (Eds.), *Fishes of Andaman Sea, west coast of Southern Thailand*, 346 pp.
- Rüppell, W.P.E.S. 1828-30. Atlas zu der Reise im nördlichen Africa. Fische des Rothen Meeres. *Frankfurt-am-Main*, p. 1-141 + 3, Pls. 1-35.
- Satish Shayak, Joshi, K. K. and Sanil, N. K. 2013. Morphological characteristics of selected body parts for trigger fishes (Tetradontiformes, Balistidae) from India with details on ultrastructural features of body scales. *Indian J. Fish.*, 60(2): 49-58.