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A New Sparid Fish of the Genus *Diplodus* From Bermuda

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The genus *Diplodus*, family Sparidae, has many described representatives, found primarily in inshore tropical and subtropical waters of the Atlantic Americas, Africa, southern Europe, the Mediterranean, the Indian Ocean and many of the offshore oceanic islands adjacent to these areas. Despite previous confusion in the literature, the form endemic to the Western North Atlantic island of Bermuda is sufficiently distinct to warrant naming it at this time.

For the following discussion all lengths are standard length (S.L.), measured with dial calipers calibrated to tenths of a millimeter with the tips placed at the tip of the upper jaw with the mouth closed and at the crease made at the end of the hypural plate when the tail is bent upward. Body depth was measured with dial calipers with the tips placed at the base of the first dorsal spine and at the base of the pelvic spine. Special care must be taken in making these two measurements because the positive separation of closely related species within this genus often depends on such accuracy. All pored lateral-line scales were counted beginning at the origin of the lateral line near the upper angle of the opercle and ending at the hypural crease noted above.

The new form from Bermuda now may be known as:

Diplodus bermudensis, new species. Figure 1.

? "Bream (*Abramis* ?)." Jones, 1859, p. 105. The name *Abramis* probably applied by Jones because Valenciennes (*in* Cuvier and Valenciennes, 1844, p. 6f.) used the common name *Brème* for that synonym of a group of cyprinoid fishes to which the common name *Bream* still is applied (Jordan, Evermann and Clark, 1930, pp. 115, 118, 350). The common name in Bermuda for the new species is *Bream*.

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FIG. 1. *Diplodus bermudensis*, new species. Holotype, CNHM 72520, 168.6 mm., S. L., from St. George's Island, Bermuda.

Sargus variegatus, non Lacépède. Goode, 1876, p. 52 (in part); Goode, 1877, p. 292 (in part).

Sargus argenteus, non Valenciennes. Goode, 1876, p. 75; Günther, 1880, p. 9. (Both writers listing this species using the name *argenteus* on the stated authority of J. M. Jones of Bermuda who reported this form to them employing the nomenclature of Günther, 1859); Goode, 1877, p. 292 (in part).

Sargus capensis, non Smith. Günther, 1880, pp. 9, 10.

Diplodus sargus, non Linnaeus. Eigenmann and Hughes, 1887, p. 73 (in part); Jordan and Fesler, 1893, p. 525 (in part); Jordan and Evermann, 1898, p. 1363 (in part)—all three of these reports on Goode's (1876, 1877) references to *Sargus variegatus*, a synonym of *D. sargus*; Barbour, 1905, p. 124 (in part); Linton, 1907, p. 87; Jordan, Evermann and Clark, 1930, p. 338 (in part); Fowler, 1936, p. 839 (in part).

Diplodus argenteus, non Valenciennes. Bean, 1906, p. 59; Meek and Hildebrand, 1925, p. 580 (in part); Fowler, 1930a, p. 148; Fowler, 1930b, p. 644; Beebe and Tee-Van, 1933a, p. 161 (in part); Beebe and Tee-Van, 1933b, p. 148 (in part); LaMonte, 1952, p. 120 (in part); Briggs, 1958, p. 282 (in part); Duarte-Bello, 1959, p. 92 (in part).

Diplodus holbrooki, non Bean. Fowler, 1930b, p. 644. Misidentification corrected to typical Bermuda *Diplodus* by Beebe and Tee-Van (1933b, p. 148). Fowler (1930b, p. 644) also recorded *D. argenteus*, non Valenciennes.

Diagnosis.—A species of *Diplodus* Rafinesque (1810) with a very reduced body depth (measuring 2.5 to 3.5 in S. L. in specimens up to 50 mm. S. L.; 2.4 to 2.9 in S. L. in specimens 51 to 70 mm. S. L.; and 2.3 to 2.5 in S. L. in specimens 71 mm. S. L. and larger, except for one with a depth of 2.2); a high lateral-line scale count (61 to 67, holotype 63); and a large dark caudal blotch as the only prominent and persisting pigmentation on the body.

Description.—Dorsal fin-ray formula XII, 13 (XI to XIII, 12 to 16, usually XII, 13 to 15).¹ Anal fin-ray formula III, 13 (III, 11 to 15, usually III, 13 or 14). Pectoral fin-ray formula, all elements, 16-16 (15 to 17, usually 16 or 17). Gill rakers 7+1+9 (7+1+9 or 10) on first gill arch.

Selected body proportions, included in Table 1, are part of the description.

TABLE 1.—Selected body proportions of typical *Diplodus bermudensis*, new species, expressed in percentage of standard length. Despite variation in each proportion, only four showed any regular progression of relative change with increase in S. L. These characters were: (1) body depth, increasing; (2) head length, decreasing; (3) eye diameter, decreasing; (4) pectoral fin length, increasing.

CHARACTER	HOLOTYPE	RANGE OF 11
	168.6 mm. S. L.	SELECTED PARATYPES 35.6 – 175.8 mm. S. L.
Body depth	44	37 – 46
Head length	30	28 – 33
Horizontal eye diameter	8	7 – 13
Tip of snout to dorsal fin origin	47	41 – 46
Tip of snout to anal fin origin	68	65 – 71
Tip of snout to dorsal fin insertion	88	86 – 89
Tip of snout to anal fin insertion	86	85 – 89
Tip of snout to pectoral fin origin	32	31 – 35
Tip of snout to pelvic fin origin	38	36 – 41
Dorsal fin origin to base of caudal fin	69	66 – 72
Anal fin origin to base of caudal fin	39	37 – 42
Pectoral fin origin to base of caudal fin	69	68 – 72
Pelvic fin origin to base of caudal fin	67	62 – 69
Length of dorsal fin base	55	50 – 58
Length of anal fin base	23	21 – 26
Length of pectoral fin base	7	6 – 7
Length of pectoral fin	38	28 – 38
Length of pelvic fin	26	19 – 24
Length of pelvic fin spine	18	13 – 17
Dorsal fin insertion to base of caudal fin	15	13 – 17
Anal fin insertion to base of caudal fin	16	14 – 16
Least depth caudal peduncle	10	10 – 11

Body completely scaled; scales ctenoid. Predorsal scales extending to a point above about center of eye. Cheeks scaled. Snout scaleless. A long ventral axillary scale. Inter-ray membranes of dorsal, anal, pelvic and pectoral fins scaleless. Small scales extending about two-thirds the way out from base of caudal fin. Lateral line a smooth shallow convex curve from its origin to just beyond end

¹ The first figure in each case is the value for the holotype, followed in parentheses by the range of values for selected paratypes.

of dorsal fin, thence nearly straight to fold formed when tail is bent upward. Several scales (usually two to four), in a line angling upward, extending onto basal portion of caudal fin. Eight scales above lateral line to origin of dorsal fin, 14 below to origin of anal fin, and seven above highest curve of lateral line to base of dorsal fin.

Dorsal outline a regular curve from tip of snout to end (insertion) of dorsal fin, with only a slight concavity above eye and a slight convexity in front of eye. Snout rather pointed, especially in smaller specimens. Ventral outline slightly convex (nearly straight) from tip of snout to pelvic fin origin, thence nearly straight to anal fin origin, and after angling upward at an angle of about 45°, nearly straight to end (insertion) of anal fin. Dorsal and anal fins low. Pectoral fin long, reaching nearly to or past origin of anal fin, and increasing in relative length with increase in body length. Caudal fin deeply forked. Mouth small, maxillary reaching just past anterior margin of orbit in small specimens and not to this point in large examples. Anterior nostril round; posterior nostril an elongate oval, the opening slit-like.

For pigmentation of body in alcohol refer to Figure 1 which is part of the description. In life, the fish is said to be silvery with dark pigmentation shown in Figure 1 being shades of gray and black. Posterior edge of opercle dark. A dark pectoral axillary spot. Pectoral fins immaculate. Inter-spine and inter-ray membranes of dorsal, anal, and caudal fins tinged with dark pigment which is more intense toward bases of fins. Anterior inter-ray membranes of pelvic fins dark, more so than those of dorsal, anal, and caudal fins. Posterior inter-ray membranes of pelvic fins immaculate.

A single outer row of incisor teeth, four on each side both upper and lower, and none notched; upper portion of each tooth essentially rectangular in outline above a narrowed base bearing a posterior buttress on inner surface; teeth protrude and are rather strongly incurved toward cutting edge; anterior corner of each lateral tooth elevated. A mosaic of small molariform teeth in anterior part of mouth immediately behind incisor teeth; behind these, in lateral posterior part of mouth, there are three rows of larger molariform teeth above, two rows below.

Vertebrae: 10 precaudal plus 13 caudal plus one hypural, equaling 10 plus 14 as usually recorded. Three predorsal bones. Two dorsal spines borne on first pterygiophore, thereafter one spine borne by each pterygiophore (a count of 0-0-0-2 as discussed by Smith and Bailey, 1961).

Holotype.—Chicago Natural History Museum no. 72520 (originally part of CNHM 48120), 168.6 mm. in standard length, from shore station 3, Bermuda Oceanographic Expedition, 1948; rocky promontory at entrance to Whalebone Bay, St. George's Island, Bermuda; 22 June 1948.

Paratypes.—All from Bermuda. CNHM 4976, 1 (176 mm.); CNHM 4978, 1 (146 mm.); CNHM 4979, 1 (125 mm.); CNHM 4980, 1 (88.5 mm.); CNHM 4981, 1 (73.5 mm.); CNHM 48327, 3 (60.3–72.4 mm.); CNHM 4977, 8 (31.8–62.2 mm.); CNHM 48108, 7 (31.4–156 mm.); CNHM 48120, 2 (29.0–130 mm.), collected with the holotype; CNHM 48291, 9 (28.1–93.2 mm.); CNHM 48092, 6 (25.3–42.5 mm.); CNHM 48199, 118 (22.2–102 mm.); CNHM 48160, 22 (19.7–82.3 mm.); USNM 178524, 1 (60.9 mm.); USNM 178505, 1 (60.3 mm.); USNM 178656, 1 (55.2 mm.); USNM 178593, 56 (41.5–78.8 mm.); USNM 177982, 6 (34.3–66.1 mm.); LACM 3337 (originally part of CNHM 48199), 5 (40.8–98.0 mm.); ANSP 101207, 1 (155 mm.); ANSP 101208, 1 (147 mm.); ANSP 101209, 4 (29.8–64.1 mm.); ANSP 101210, 31 (22.1–77.9 mm.); UMMZ 172336, 1 (143 mm.); UMMZ 172364, 1 (130 mm.).

Referred material.—Because of their condition or very small size the following Bermudian specimens are not included as paratypes. However, they clearly are *D. bermudensis*, and those collected by Goode probably are the specimens upon which he (1876, 1877) first listed *Diplodus* from Bermuda. Referred specimens are: CNHM 61771, 1 (27.3 mm.); USNM 21385, 1 (263 mm.), "Goode, 1877"; USNM 10337, 1 (184 mm.), "Goode"; USNM 21892, 1 (170 mm.), "Goode, 1876–77"; USNM 23603, 1 (106 mm.), "Goode, 1877"; USNM 23601, 1 (97.4 mm.), "Goode, 1877"; USNM 178331, 3 (small); USNM 178337, 1 (small); USNM 178338, 1 (small); USNM 178549, 17 (small); USNM 178586, 27 (small); USNM 178550, 4 (small).

Questionable records.—There is a specimen (USNM 178506) labeled *D. argenteus* and cataloged as having been collected by William Beebe at Somerset, Jamaica which, obviously, is an example of *D. bermudensis*. Somerset, Jamaica is an inland mountain village, but Somerset, Bermuda, is a locality from which many *bermudensis* have come. Although I have seen no *Diplodus* listed as having been collected by Beebe at Somerset, Bermuda, he collected many examples elsewhere in Bermuda and the listing of Jamaica undoubtedly is in error. Furthermore, despite many efforts to find this genus in my studies on the fishes of Jamaica over the past seven years, I have failed to

find it myself and I have failed to find any record of it in the literature or specimens in museums.

There is an old specimen (USNM 16827) in very poor condition labeled *D. argenteus* and listed as having been collected by G. Blackford at the New York market. The specimen best fits *D. bermudensis*, but as no other specimens referable to *bermudensis* have been reported reliably from anywhere other than Bermuda, it is likely that this specimen, if correctly identified as this species, was imported from Bermuda possibly as an exotic or is mislabeled as to locality.

Relationships.—Although apparently a very common form in Bermuda (Goode, 1876, p. 52; Barbour, 1905, p. 124; Beebe and Teevan, 1933a, p. 162; and as evidenced by large numbers of specimens in collections) and, thus, theoretically subject to closer scrutiny than apparently has been given it, there has been much confusion as to the proper assignment of a specific name to the Bermuda form of *Diplodus*. As noted by Barbour (1905, p. 124) and Beebe and Teevan (1933b, p. 148), Goode (1876, p. 52), in first reporting it from Bermuda, for some reason even confused it with the kyphosid *Kyphosus sectatrix* (Linnaeus).

With the exception of Fowler's (1930b, p. 644) direct misidentification of a single specimen, the confusion has been whether to ally the Bermudian form of *Diplodus* with the American species *argenteus* (including *caudimacula* by most authors, a species I consider distinct) or with the European species *sargus*. With the exception of the misidentification of Fowler, the other names applied to *bermudensis* are now recognized as synonyms of *sargus*.

The confusion of *bermudensis* with *argenteus* and *sargus* probably lay in the similar high lateral-line scale counts for these three species (61 to 67 in *bermudensis*; 62 to 67 in *argenteus*; 61 to 66 in *sargus*). *D. bermudensis* can be distinguished from both of these species; it can, in fact, be distinguished from all other described species of the genus *Diplodus*, with the exception of *noct* and *prayensis*, by its reduced body depth.

From *noct*, an Indian Ocean form, *bermudensis* can best be separated on mean lateral-line scale count (61 to 67 in *bermudensis*, with a mean of 64; 57 to 64 in *noct*, with a mean of about 61) and a greatly reduced caudal pigment blotch in *noct* (see illustration of *noct* in Day, 1878-88, pl. 32, or Blegvad, 1944, p. 143, as compared to the illustration of *bermudensis* herein).

From *prayensis*, from the Cape Verde Islands, *bermudensis* can best be separated on mean lateral-line scale count (61-67 in *bermudensis*,

with a mean of 64; 57–59 in *prayensis*, *vide* Cadenat, 1964, p. 966) and the presence of a dark bar across the nape in *prayensis* (*vide* Cadenat, 1964, p. 966, fig. 8) which is lacking in *bermudensis*. Furthermore, the black caudal blotch apparently is more extensive in *bermudensis* (fig. 1) than in *prayensis* (*vide* Cadenat, 1964, fig. 8).

Remarks.—Collette (1962, p. 438) commented that at least three Bermuda endemic fishes have a lesser body depth than do the species from which they apparently were derived. I believe that *bermudensis* was derived from one of the other American species of the genus and thus Collette's comment seems to hold in this instance as well.

Acknowledgments.—It was intended originally that Dr. James E. Böhlke be co-author of this new form inasmuch as he recognized its validity at about the same time that I did. However, other duties prevented him from joining me in naming it, and he generously suggested that I proceed alone.

I am grateful to Mr. Arden H. Brame, Jr., of the University of Southern California and the Los Angeles Museum (LACM), for his careful execution of much of the drudgery in making many of the counts and measurements on the large number of paratypes.

I am also grateful for the opportunity to examine specimens of Bermudian *Diplodus* in the following museums: Chicago Natural History Museum (CNHM), through Loren P. Woods; United States National Museum (USNM), through Leonard P. Schultz; University of Michigan Museum of Zoology (UMMZ), through Robert R. Miller; and Academy of Natural Sciences of Philadelphia (ANSP), through Dr. Böhlke.

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