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A NEW SPECIES OF TILEFISH (PISCES: BRANCHIOSTEGIDAE) FROM BERMUDA, WITH A BRIEF DISCUSSION OF THE GENUS *Caulolatilus.*

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ABSTRACT: A new species of tilefish, *Caulolatilus bermudensis* (family Branchiostegidae) is described from two specimens taken by hook and line from depths of 270 and 366 meters off Bermuda. These represent the only known records of the genus from Bermuda. Included is a brief discussion of the genus *Caulolatilus* and a key to the western Atlantic species.

The genus *Caulolatilus* is presently represented by 11 species (eight western Atlantic and three eastern Pacific). This includes three species recently described from: 1) the slopes of the Bahama Islands (Berry, 1978), 2) California, the Gulf of California, and Galapagos Islands (Dooley, 1978), and 3) Cay Sal Bank and St. Croix, Virgin Islands (Dooley and Berry, 1977). A fourth new species described herein represents the first record of the genus from Bermuda. Two species (342 and 283 mm SL), were collected by R. Doc and E.B. Tucker from Bermuda and given to J. Burnett-Herkes, Bermuda Government Aquarium. These specimens were forwarded to W.F. Smith-Vaniz and deposited in the collection of the Academy of Natural Sciences of Philadelphia (ANSP).

The genus, in the western Atlantic, ranges from North Carolina and Bermuda south to Florida, through the Gulf of Mexico, British West Indies, Virgin Islands, Caribbean, Lesser Antilles and South America to Rio de Janeiro (Dooley, 1978). Species of *Caulolatilus* from the eastern Pacific range from Vancouver Island, British Columbia (ca. 49°07′ N) along the Pacific coast of the U.S., Guadalupe, Cerros and Rivilla Gigedo Islands, throughout the Gulf of California, south to Ecuador, the Galapagos Islands and to Arica, Chile (ca. 23°30′ S).

The branchiostegids are generally epibentic, although some are known to inhabit caves or crevices. *Lopholatilus chamaeleonticeps* has been photographed inhabiting caves in the Hudson Canyon (K. Able, pers. comm.). Species of *Caulolatilus* have been observed inhabiting burrows on the continental shelf off south Florida (R.S. Jones, pers. communication). Branchiostegids are found along the edge and upper slope of continental margins and canyons, and along the upper slopes of some islands. Depth ranges of from 18 m (for *C. princeps*) to 495 m (for *C. cyanops*) have been recorded (Dooley, 1978). However, 100-200 m depths are more common for the genus.

Caulolatilus bermudensis, New species
Bermuda Tilefish
Fig. 1

Diagnosis

C. bermudensis differs from all other species of the genus by the combination of the following characters: no dark pigment on the predorsal ridge, along the base of the dorsal fin or patterned upper body; without large dark spot above pectoral axil; diffuse dusky area present (more evident on paratype); a dusky peritoneal lining; dorsal fin membrane dusky, without a well defined pigment pattern; body with about 20 vague yellow bars on

paratype, holotype without visible bars; a low dorsal fin height (7.5%SL); seven dorsal spines; one anal spine; 16 pectoral fin rays; a scaled interoperculum; a truncate or slightly emarginate caudal margin; orbital width to suborbital depth ratio of 1.66-2.04 and a unique arrangement of the adductor mandibulae musculature, specifically the $A_3\beta'$ muscle, inserting on the A_2 tendon rather than on the $A_3\beta$ tendon as found in all other species of the genus.

Methods

Counts and measurements follow Dooley (1978). The specimens were initially frozen, then preserved in 10% formalin and stored in 75% ethanol.

Description

The following counts and measurements were taken from the holotype and paratype (given in parentheses if different).

Dorsal fin rays VII, 24; anal fin rays 1, 22 (23); pectoral fin rays 16 on each side; pelvic fin rays I, 5; branchiostegal rays 6 on each side; total first arch gill rakers 18; or 7 + 11; a total of 45 along the lateral sides of all four arches; cheek sclaes from preopercular angle to orbital rim 11; opercular scale rows 8; pored lateral line scales ca. 80 (84) plus two (4) beyond hypurals; scales above lateral line 10 (12); scales below lateral line 37; vertebrae 11 + 16.

Body depth 29% SL; body width 14% (15) SL; caudal peduncle length 11% (10) SL; caudal peduncle depth 9% (8) SL; head length (HL) 29% (28) SL; predorsal length 34% (32) SL; head depth 82% (81) HL; snout length 37% (34) HL; length of upper jaw 37% (35) HL; length of lower jaw 42% (33) HL; cheek depth 29% (27) HL; opercular length 26% HL; orbit diameter 25% (27); suborbital depth 16% (14) HL.

Jaws extend posteriorly to under the anterior third of orbit; teeth moderately small and number 20-23 (18-20) along each side of outer margin of upper jaw, including two antrorsely curved teeth at

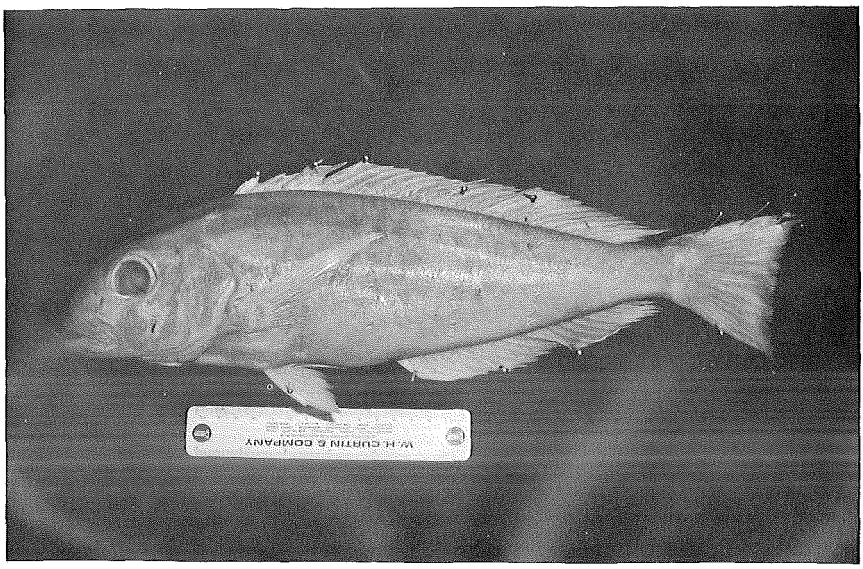

Figure 1. Holotype of *Caulolatilus bermudensis*, from the south shore of Bermuda, depth of 366m; ANSP 137600; 342 mm SL; 407 mm TL; collected 20 December 1973, photographed in May, 1978.

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the rear of both upper and lower jaws; lower jaw with about 20 (17) teeth along outer margin of each side; upper and lower jaws with patches of villiform teeth at their symphyses.

Preoperculum finely serrated on upper limb; angle of preoperculum about 85°; single stout spine on operculum; gill rakers short and blunt, slightly longer than width of base; cephalic lateral line pores not as numerous nor evident as in other species; mandibular series with seven on one side and five on the other half of the jaw on holotype, five on each side on the paratype.

Scales on head extend to just anterior of above mid orbit; pectoral fins with a small patch of scales on their bases; caudal almost entirely covered with small scales, remaining fins naked.

Dorsal fin height low, 7.5% SL; spinous portion slightly lower than soft ray portion; dorsal fin base 64% (61) SL; first and second spines united at their bases to a common pterygiophore; origin over dorsal portion of pectoral fin base; rays all branched; third and fourth to last ray elongate, reaching to just anterior of hypural base.

Anal fin about equal in height to dorsal fin; origin below between the fifth and sixth dorsal soft rays; one spine, about 2.5 into length of first anal soft ray, rays all branched; third to last ray elongate and not quite reaching to below tip of the longest dorsal ray.

Pectoral fins broad and pointed, reaching to above third or fourth anal soft ray (holotype) or just past anus in paratype; fin length 26% (25) SL; all but upper stout ray branched.

Pelvic fins broad and pointed; origin somewhat posterior to ventral base of pectorals, reaching to just anterior of anus; length of fins 15% SL; all rays branched.

Caudal fin truncate, or slightly emarginate with elongate dorsal and ventral tips; 17 principal rays, 15 branched; 12 dorsal and 10 ventral procurrent rays.

Coloration

Live coloration not known; preserved specimens badly depigmented. Some diffuse pigment above and in pectoral axil on holotype (small diffuse area more evident on paratype). No dark markings along base of dorsal fin on holotype or paratype or upper body; paratype with violaceous snout, upper lip and upper body and ca. 20 vague yellow body bars, white belly; several light streaks (formerly yellow?) appear in the caudal fin; dorsal fin membranes appear dusky with no pattern; pectorals and pelvics are translucent, anal fin partially opaque near base.

Materials

Holotype, ANSP 137600 , 342 mm SL; 407 mm TL; 750g preserved wt.; south shore of Bermuda, caught on hook and line by R. Doe in 200 ftms (366 m), 20 December 1973; specimen forwarded by W. Smith-Vaniz (ANSP). Paratype, ANSP 139343, 283 mm SL; 345 mm TL; 465g preserved wt.; 6 mi. (9.7 km) N. W. of Bermuda, caught on hook and line by E.B. Tucker, 150 ftms. (270 m), coral rubble/sand coll. 1978.

Based upon comparative myology, principally adductor mandibular musculature, the genus exhibits the following associations according to Marino and Dooley (1981):

1. Microps groups, with *C. microps* and *C. guppyi* exhibiting a close relationship, and *C. williamsi* and *C. dooleyi* likewise, having a close affinity. Also, there is a progressive trend from the most generalized *C. microps* to more complex musculature in *C. guppyi, C. williamsi* and *C. dooleyi* respectively.
2. Affinis group, including the species *C. affinis, C. cyanops, C. intermedius, C.*

chrysops, C. hubbsi, C. bermudensis and *C. princeps,* with *C. affinis* being the most generalized, and a progressive degree of development successively from *C. cyanops, C. intermedius, C. chrysops* to *C. hubbsi* respectively. *C. princeps* appears to have uniquely developed musculature and probably evolved early in the lineage leading to the remaining species of the group. Likewise, *C. bermudensis* exhibits a unique and independent arrangement of the adductor mandibulae complex. Whereby the superficial subdivision of $A_3\beta$ ($A_3\beta'$) uniquely inserts on the A_2 tendon, with only a small number of fibers inserting on the $A_3\beta$ tendon. The other affinis group species all have their $A_3\beta'$ inserting entirely on the $A_3\beta$ tendon.

C. bermudensis differs from the three Pacific species in having fewer dorsal spines (7 vs 8 or 9), fewer first arch gill rakers (18 vs 21-25), and fewer anal spines (one vs two). *C. bermudensis* differs from four of the Atlantic species (*C. microps, C. williamsi, C. intermedius* and *C. guppyi* in having scales on the interoperculum. *C. bermudensis* shares the scaled interoperculum character with *C. chrysops, C. cyanops* and *C. dooleyi.* However, *C. bermudensis* has fewer dorsal fin spines (7 vs 8) and fewer pectoral rays (16 vs 18-19) than *C. chrysops* and lacks the prominant dark spot above the pectoral fin axil and the dark pigmentation on predorsal ridge. *C. bermudensis* also lacks the large dark area above the pectoral axil found in *C. cyanops,* lacks the dark stripe along the dorsal fin base, and lacks the dark upper body reticulations. *C. bermudensis* also differs from *C. cyanops* in having a dusky peritoneal lining (white or translucent in *C. cyanops*), a lower dorsal fin (7.5% SL vs 10% SL in *C. cyanops*). *C. bermundensis* differs from *C. dooleyi* in having a much lower dorsal fin (7.5% SL vs 12% in *C. dooleyi*), somewhat smaller suborbital depth into orbit diameter (1.66 - 2.04 vs 1.7-2.3) in *C. dooleyi,* anal origin more posterior in *bermudensis* (below dorsal rays 5 and 6 vs 4 and 5 in *dooleyi*); jaws more posteriorly placed in *bermudensis* (under anterior third of orbit vs just under anterior rim or orbit in *dooleyi*). *C. bermudensis* has a dusky peritoneum with underlying silver-white pigment, *C. dooleyi* has a white peritoneum; and finally differs in adductor mandibulae musculature as previously mentioned.

Key to the Western Atlantic species of *Caulolatilus*

1a. Interoperculum with scales 2
1b. Interoperculum naked 5
2a. Dorsal fin elements VII, 23-24; pectoral fin rays 16 or 17 (rarely 18); no broad yellow-gold patch under eye to nostril 3
2b. Dorsal fin elements VIII, 23-25; pectoral fin rays 18 or rarely 19; a broad yellow-gold patch under eye to nostril — *chrysops* (Valenciennes, 1833) (North Carolina to Florida, Cuba, Venezuela, Brazil).
3a. Spinous dorsal membrane brilliant orange-yellow; upper body with dark markings; dorsal fin height about 10% SL; base with a dark line along its entire length; a large dark area above pectoral fin axil; emarginate caudal with broad yellow areas on each lobe — *cyanops* Poey, 1866 (North Carolina to Florida, Gulf of Mexico, Nicaragua, Colombia [Atlantic], and West Indies).
3b. Spinous dorsal dusky, not a brilliant orange-yellow; upper body without dark markings; dorsal fin height 7.5% or about 12% SL, base without a dark line along its base; no large dark area above pectoral fin axil (a small diffuse dusky spot may appear); truncate or slightly emarginate caudal without broad yellow areas on each lobe — 4.
4a. Dorsal fin height 12% SL; anal origin

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below dorsal soft rays 4 and 5; peritoneum white with a few dark speckels; jaws extending posteriorly to under anterior margin of fleshy orbit ..... *dooleyi* Berry, 1978 (Bahamas)

4b. Dorsal fin height 7.5% SL; anal origin below dorsal soft rays 5 and 6; peritoneum dusky; jaws extending well under orbit to anterior one-third eye ..... *bermudensis* N. sp. (Bermuda).

5a. Dorsal fin elements VII (rarely VI or VIII), 23-27; anal fin I or II, 20-24; pored lateral line scales 73-91; perdorsal ridge black; body depth 24-34% SL; body may have dark reticulations, but has no vertical yellow bars; caudal may have some yellow markings, but lack large yellow area on lower portion ..... 6.

5b. Dorsal fin elements VIII, 22-23; anal fin I, 24-25; pored lateral line scales 96 or more; predorsal ridge not dark or differently pigmented; body elongate, body depth 23% SL; body with 17-22 yellow, wavy vertical bars; caudal with a brilliant yellow area covering most of lower portion — *williamsi* Dooley & Berry, 1977 (Great Bahama Bank, Cay Sal Bank, Virgin Islands).

6a. Dorsal fin VII (rarely VI), 23-26; anal fin I or II, 20-23; prominent dark area above axil or pectoral fin; distinct dark suborbital bar, dark area on snout; caudal fin rounded (double emarginte); dorsal fin membrane with a pattern of dark blotches; pored lateral line scales 73-81 (modally, 78); orbit diameter to suborbital depth greater than 1.8 ..... 7.

6b. Dorsal fin VII (rarely VIII, 24-27;) anal fin II, 22-24; no dark area above axil of pectoral fin; no suborbital bar or dark area on snout; caudal fin truncate; dorsal fin membrane without any distinct pattern; pored lateral line scales 80-90 (modally 85); orbit diameter to suborbital depth less than 1 ..... *microps* Goode & Bean, 1878, (Virginia to Gulf of Mexico).

7a. Upper body covered with dark mottlings; dark predorsal ridge without an anterior prominent dark semicircle; mouth extends posteriorly to well under eye..... *guppyi* Beebe & Tee-van, 1937 Venezuela to Guyana and Trinidad.

7b. Upper body uniformly pale brown or violaceous, without any dark pattern of mottling; dark predorsal ridge preceded by a prominent dark semicircle; mouth extends posteriorly to just under anterior rim of orbit ... *intermedius* Howell y Rivero, 1936 (Gulf of Mexico, Cuba)

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