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The Genus *Bascanichthys* (Pisces: Ophichthidae) in the Gulf of Mexico

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The taxonomic history of the ophichthid genus *Bascanichthys* in the west Atlantic is reviewed. *Bascanichthys scuticaris* is redescribed; *B. teres* is considered a synonym of *B. scuticaris*; *B. bascanium* is redescribed and a neotype is designated. *B. scuticaris* is distinguished from *B. bascanium* chiefly by preanal vertebral number (79–89 vs 94–101), pectoral-fin width and head length. The ecology and geographic distribution of the two recognized species are discussed; comments are made on their biology and life histories.

THE circumglobal eel genus *Bascanichthys* Jordan and Davis comprises approximately 16 nominal species (Storey, 1939; McCosker, 1977). Two species are known from the Gulf of Mexico; neither has been satisfactorily described, or had its distribution delineated. Ever since Jordan (1884) described *Caecula bascanium* from the Gulf of Mexico and questioned the validity of *C. scuticaris* and *C. teres* as distinct species, the number of species in this genus in the western North Atlantic has been in question. Subsequent studies of these

nominal species, now assigned to the genus *Bascanichthys*, were inconclusive, largely because specimens were few and identifications unreliable (Storey, 1939; Ginsburg, 1951). In this paper we evaluate the taxonomic status of the forms of *Bascanichthys* occurring in the Gulf of Mexico. The species recognized and treated are *B. scuticaris* (= *B. teres*) and *B. bascanium*. After a thorough search, we conclude that the holotype of *Caecula bascanium*, the type of *Bascanichthys*, has been lost. Consequently, we designate a neotype.

Methods and Materials

Counts and measurements were made on all available specimens except for large collections from the Lemon Bay and Gasparilla Island areas of Florida (in which every fourth specimen was measured) and for those specimens whose condition precluded some or all measurements. Measurements follow Ginsburg (1951) except: length of branchial aperture was greatest distance between dorsal and ventral angles of branchial aperture; pectoral-fin width was distance between dorsal and ventral edges of pectoral-fin base at point of attachment to body; and lateral-line pore number was number of pores in horizontal series along body beginning with pore immediately dorsal to branchial aperture and excluding those curving anterodorsally to branchial basket. Total length (TL), body, trunk, tail and head lengths, and depth at anus were measured to nearest 0.1 mm with dial calipers. Other measurements were made with a calibrated ocular micrometer in a dissecting microscope. Body, trunk and tail measurements were rounded off to nearest mm for calculations. Vertebral counts were made from radiographs. Branchiostegal counts were made from cleared and stained specimens. Four specimens of each species were cleared and stained following the method of Taylor (1967).

Specimens examined are from: Academy of Natural Sciences, Philadelphia (ANSP); Alabama Marine Resources Laboratory, Alabama Department of Conservation (AMRL); Field Museum of Natural History (FMNH); Florida Department of Natural Resources, Marine Research Laboratory (FSBC); Florida State Museum, University of Florida (FSM); Florida State University (FSU); Gulf Coast Research Laboratory (GCRL); Institute of Marine Sciences, University of North Carolina (UNC); Institute of Marine Sciences, University of Texas (IMS); Jacksonville University (JU); Moody College of Marine Sciences, Texas A&M University (MCMS); Museum of Comparative Zoology, Harvard University (MCZ); Museum of Zoology, University of Michigan (UMMZ); Pensacola Junior College (PJCMC); Rosenstiel School of Marine and Atmospheric Sciences, University of Miami (UMML); Texas A&I University (TAI); Texas Natural History Collection, University of Texas (TNHC); Tulane University Museum of Natural History (TU); National Museum of Natural History (USNM); University of Alabama (UAIC); University of Southwestern Louisiana (USWL).

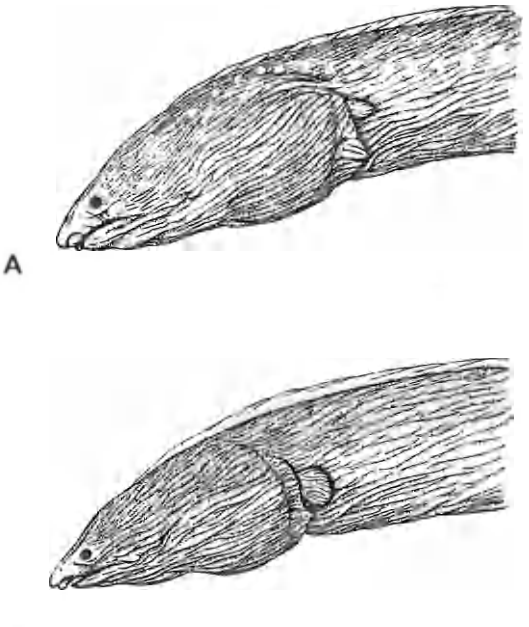

Fig. 1. Head and pectoral fin characteristics in A) *Bascanichthys scuticaris*, FSU 18801, 467 mm TL; Alligator Harbor, Florida; B) *B. bascanium*, FSU 18208, 418 mm TL; St. Andrews Bay, Florida.

Bascanichthys scuticaris (Goode and Bean)
Whip eel
Figs. 1A, 2A, 3

Sphagebranchus scuticaris Goode and Bean, 1880 (original description; holotype USNM 23636; type-locality: Cedar Key, Florida).

Sphagebranchus teres Goode and Bean, 1882 (in part; original description; lectotype USNM

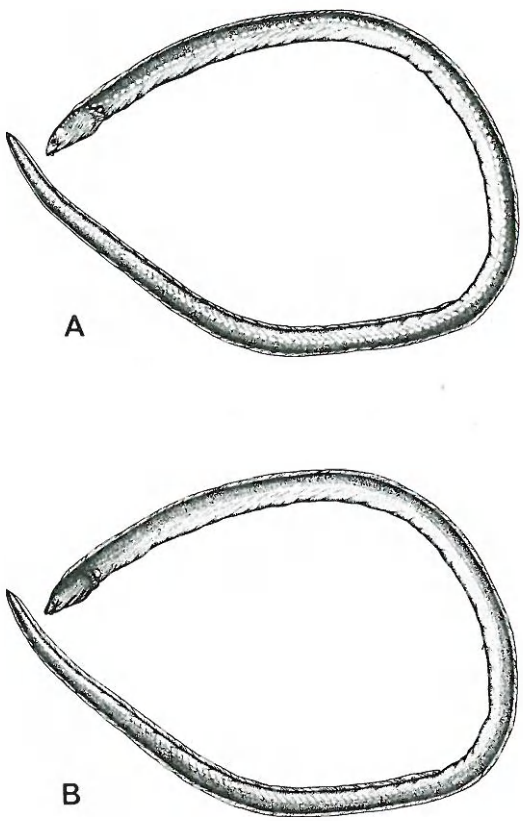

Fig. 2. Body form and lateral line color pattern in A) *Bascanichthys scuticaris*, FSU 18801, 467 mm TL; Alligator Harbor, Florida; B) *B. bascanium*, FSU 18208, 418 mm TL; St. Andrews Bay, Florida.

31457, paralectotype USNM 152575, paralectotype USNM 220010 not *B. scuticaris*; type-locality: west Florida).

Nomenclatural history.— *Sphagebranchus scuticaris* was described by Goode and Bean (1880) from a single specimen collected at Cedar Key, Florida. Jordan and Gilbert (1883) placed it in *Caecula*. Jordan (1885) transferred it to *Callechelys*. In 1892, Jordan and Davis assigned *C. scuticaris* to their newly described genus, *Bascanichthys*.

Sphagebranchus teres was described by Goode and Bean (1882) from three specimens. The collection site is listed only as west Florida. This species was placed in *Caecula* by Jordan and Gilbert (1883) and later in *Callechelys* by Jordan (1885). In 1892, Jordan and Davis placed it in the synonymy of *C. scuticaris*. Storey (1939) reviewed the genera *Callechelys* and *Bascanichthys* and resurrected *B. teres*. She indicated that its synonymy with *B. scuticaris* was erroneous because the holotype of *B. scuticaris* had biserial dentition on both jaws. Ginsburg (1951) also recognized *B. teres* as valid, distinguishing it from *B. scuticaris* by proportional measurements (body depth as % TL, body depth in head length and upper jaw length in body depth). He discounted the importance of light spots along the lateral line system, stating that "both species have the same variable color pattern." None of the three type-specimens of *B. teres* had been selected as a holotype, so Ginsburg designated the specimen with the greatest body depth as the lectotype.

Material examined.—Holotype of *S. scuticaris* (USNM 23636, Cedar Key, Florida), lectotype of *S. teres* (USNM 31457, west Florida), one paralectotype of *S. teres* (USNM 152575, west Florida) and 371 other specimens ranging in size from 156–770 mm TL, from Veracruz, Mexico, to Beaufort, North Carolina, contained in the following lots: ANSP 69939, 101021, 11782; FMNH 32401, 34989, 34990, 34992, 34993; FSBC 1077, 1095, 5582, 5974, 6106, 6108, 7222, 7247, 7251; FSM 2360, 9114, 10232, 12323, 12325, 12620, 17507, 18239; FSU 1516, 2553, 13098, 17314, 17421, 18298, 18365, 18468, 18801, 18806, 18892, 21238; GCRL V68-2856, V70-4930; MCZ 9225, 34169; PJCMC 73-783; TU 6075, 21083; UAIC 300; UMML 827, 5027, 5031, 15710, 17728; UMMZ 153699, 153722, 153763, 153795, 153809, 153849, 153858, 153917, 153949, 154035, 155077, 155078; USNM 43116, 104328, 104334, 114762, 132516, 157941.

Diagnosis.—*B. scuticaris* is distinguished by following characters: 151–173 total vertebrae (holotype: 162); 79–89 preanal vertebrae (holotype: 83); 141–159 lateral-line pores; 16–17 branchiostegal rays on epihyal; pectoral-fin width 17–35% branchial-aperture length (holotype: 25%); head relatively longer than in *B. bascanium* (Fig. 1); small lightly pigmented spot dorsal to each lateral-line pore (Fig. 2A) (spotted pattern may be absent in specimens < 175 mm TL; may be diffuse on body of specimens > 600 mm TL, but is distinguishable above branchial basket).

Description.—Characters mentioned in diagnosis are not repeated here except where clarification is required. Body length 50–58, trunk length 45–51, tail length 43–50, head length

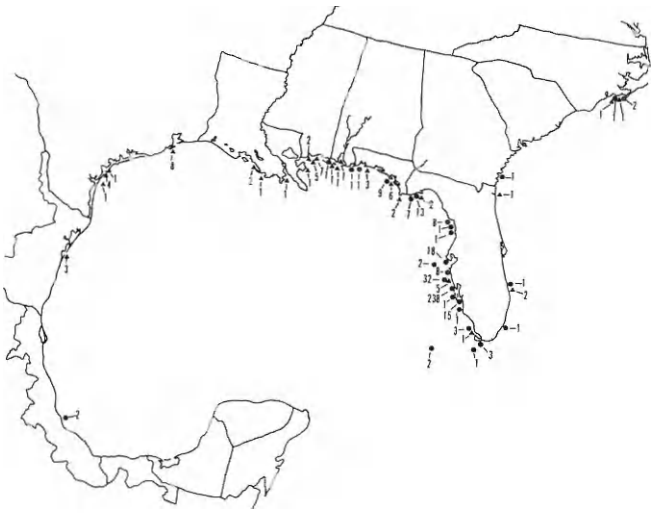

Fig. 3. Distribution of *Bascanichthys scuticaris* and *B. bascanium*. Numerals indicate numbers of specimens taken from collection sites and may represent two or more collections. Dots—*B. scuticaris*; triangles—*B. bascanium*.

5.1–7.5, all in % TL; body depth 1.1–2.9% TL, 18.9–55.5% head length; eye diameter 24.0–42.9% snout length; 67–85 postanal vertebrae. Pectoral fin longer or shorter than wide. Teeth conical, recurved; uniserial in both jaws (45 specimens), or, in part, irregularly biserial on one or both sides of upper and/or lower jaw (9 specimens). Dentition of holotype anomalous for species; biserial on lower jaw, biserial and partially triserial on upper jaw. Premaxillary teeth usually three, larger than jaw teeth; vomerine teeth in two or three irregular rows anteriorly, becoming uniserial posteriorly. Cephalic lateralis system and lateral line ossicles as described for genus by McCosker (1977). Ground color brown to beige above midline, lighter below; dorsal and anal fins lighter than body.

Discussion.—Our study shows that Ginsburg's proportional measurements are unreliable indices for species determination. On the basis of distinctive morphological characters listed in the species diagnosis, we determined that among the three specimens in the *B. teres* type-series, the lectotype (USNM 31457) and one paralectotype (USNM 152575) are conspecific with the holotype of *B. scuticaris*; the other paralectotype (USNM 220010), however, agrees with *B. bascanium* (Jordan, 1884). Characteristics follow for type-specimens of *B. teres*, lectotype (USNM 31457; designated by Ginsburg, 1951): 525 mm TL; 159 total, 82 preanal, 77 postanal vertebrae; branchiostegal rays not countable in radiographs; 147 lateral-line pores; pectoral-fin width 17% branchial-aperture length; color pattern not discernible (= *B. scuticaris*). Paralectotype no. 1 USNM 152575: 482 mm TL; 159 total, 83 preanal, 77 postanal vertebrae; 151 lateral-line pores; branchiostegal rays and color pattern not discernible; pectoral-fin width 20% branchial-aperture length (= *B. scuticaris*). Paralectotype no. 2 USNM 220010: 470 mm TL (from original description); 184 total, 100 preanal, 84 postanal vertebrae; condition of specimen precluded accurate determination of other characters (= *B. bascanium*).

Bascanichthys bascanium (Jordan)
Sooty eel
Figs. 1B, 2B, 3

Caecula bascanium Jordan, 1884 (original description; holotype, Museum of Yale College 826, lost; neotype, herein designated, USNM 219832; type locality: Egmont Key, Florida).
Sphagebranchus teres Goode and Bean, 1882: 436 (in part; original description; paralectotype USNM 220010; lectotype USNM 31457, paralectotype USNM 152575 not *B. bascanium*; type locality: west Florida).

Nomenclatural history.—*Caecula bascanium* was described by Jordan (1884) from one specimen

(now lost) collected at Egmont Key, Florida; assigned to *Callechelys* by Jordan (1885) and designated the type species of a new genus, *Bascanichthys*, by Jordan and Davis (1892). Storey (1939) considered it a valid species known only from the holotype. Ginsburg (1951) synonymized *B. bascanium* with *B. teres* on the basis of body measurements, indicating that the "shorter head and better developed pectoral fin," of the type, characters which Jordan used to distinguish *C. bascanium* from *C. teres*, were due to the large size (778 mm TL) of the specimen and fell within the range of measurements of *B. teres*.

Material examined.—Neotype of *B. bascanium* (USNM 219832; Alligator Harbor, Florida), one paralectotype of *S. teres* (USNM 220010; west Florida) and 65 other specimens ranging in size from 193–786 mm TL, from Tamaulipas, Mexico, to Beaufort, North Carolina, contained in the following lots: AMRL 540; ANSP 101-021; FMNH 46307; FSM uncat.; FSU 11561, 18208, 18891, 21239, 22972; GCRL V61-441, V66-1572; IMS 797, 798, 799, 1098, 2150; JU 102, 1300; MCMS uncat.; MCZ 9167; TAI X1-212; TNHC 7170; TU 6164; UMML 17738; UMMZ 153808, 154091; UNC 3591; USNM 119349, 125910, 147792, 155005, 156855, 305798, 31457; USWL 4274, 4338.

Diagnosis.—*B. bascanium* is distinguished by following characters: 177–190 total vertebrae (neotype: 188); 94–101 preanal vertebrae (neotype: 99); 163–174 lateral-line pores (neotype: 171); 18–19 branchiostegal rays on epihyal; pectoral-fin width 36-86% branchial-aperture length (neotype: 47%); head relatively shorter than in *B. scuticaris* (Fig. 1); no spots along midlateral line or above branchial basket.

Description.—Characters mentioned in diagnosis are not repeated here except where clarification is required. Body length 49–57, trunk length 45–51, tail length 44–50, head length 4.2–5.7 all in % TL; body depth 1.0–2.2% TL, 22.2–47.6% head length; eye diameter 23.1–38.1% snout length; 81–91 postanal vertebrae. Teeth conical, recurved; uniserial in both jaws (56 specimens); no indication of biserial dentition. Premaxillary and vomerine teeth as in *B. scuticaris*. Cephalic lateralis system as described for genus by McCosker (1977). Lateral-line ossicles of specimens < 300 mm TL look like thin light lines punctuated by slightly larger spots, in close examination readily distinguishable from pigmentation pattern of *B. scuticaris*. Ground color sooty grey or brown to beige above, paler below; dorsal and anal fins paler than body.

Discussion.—Jordan (1884) distinguished *Caecula bascanium* from *C. scuticaris* by "the shorter head and better developed pectoral fin." He also indicated that the eye diameter was slightly more than half the snout length and that the dorsal-fin origin was midway between the front of the eye and the branchial aperture. The head of the holotype was described as 4.5% TL which is consistent with the head size of our specimens of *B. bascanium* (4.2–5.7% TL). The pectoral fins of our specimens of *B. bascanium* are noticeably larger than those of *B. scuticaris*, although not as large as Jordan (1884) indicated for the holotype of *B. bascanium*. Eye diameter of our material ranges from 25–40% snout length rather than 50% snout length indicated by Jordan, and the dorsal fin originates closer to the eye than to the branchial aperture. These minor dissimilarities may be due to differences in methods of measuring, but this cannot be confirmed because Jordan (1884) did not define his methods; or the holotype may have been anomalous, a situation not uncommon in eels. In either case, Jordan's (1884) description of *B. bascanium* agrees in the two salient characters (head length, pectoral-fin size) with the second species of the genus in the Gulf of Mexico, but not with any other known Atlantic species of *Bascanichthys*. Consequently, we recognize the name *B. bascanium* as applying to the second species in the Gulf of Mexico.

Distribution and Ecology

The known geographic distributions of *B. scuticaris* and *B. bascanium* are shown in Fig. 3. *B. bascanium* is abundant from Mobile Bay, Alabama, west to Brownsville, Texas. *B. scuticaris* has not been collected in this area. *B. scuticaris* is more common in collections from Cape San Blas, Florida, to the Florida Keys with *B. bascanium* being taken occasionally in that area. Collections from Mobile Bay to Cape San Blas yielded nearly equal numbers of both species. Although both species have been taken in Mexican waters, the scarcity of specimens from those waters makes it impossible to determine any distributional trends for that area. The ab-

sence of specimens in collections from the Yucatan Peninsula and southward makes it impossible to determine the southernmost limit of either species. The northernmost locality of capture for both species is Beaufort, North Carolina. The small number of collections from Florida to North Carolina makes it impossible to draw a conclusion as to the more common species in that area.

The majority of eels was found close to shore. Two specimens from North Carolina were dug up on a sandy beach. Numerous specimens from Florida's west coast were taken in areas exposed during low tide. A few specimens were taken in deeper water: one *B. bascanium* in 24 m off North Carolina, one *B. scuticaris* at the surface at night over 31 m off Sarasota, Florida, and another in a trawl at 46 m off Tampa, Florida. Scarcity of specimens from deeper waters may be due to inefficient collecting methods and the fossorial habits of these eels, and may not reflect their depth distributions.

No difference in habitat preference can be discerned between the two species. In all known cases the bottom type was sand in proximity to at least some sparse grass beds. Available data from Mobile Bay to Cape San Blas do not indicate any separation of species by habitat type, food habits or breeding season. Nearly equal numbers of both species were taken during a poisoning off jetties in St. Andrews Bay, Florida.

Species of *Bascanichthys*, as well as other ophichthids, seem to be much more common in coastal waters than the various collecting methods indicate. In September 1974, one week after a red-tide kill from Pensacola to Panama City, Florida, casual examination of carcasses in the tidal wash on the beaches revealed a minimum of 30 specimens per 100 m of beach which, despite their deterioration, could be positively identified as *Bascanichthys*. In October 1976, following a red-tide kill off Sarasota, Florida, specimens of *B. scuticaris* of at least 1,000 mm TL were common on the beach.

Biology

The information in this section applies to both *B. scuticaris* and *B. bascanium*. The stomach is a greatly distensible thick-walled diverticulum which, from its anterior juncture with the esophagus, extends posteriorly on the left side. The intestine is a straight tube, thick-walled with a rugose internal surface anteriorly, thin-walled with a smooth internal surface posteriorly. McCosker's (1977) examination of stomach contents of *Allips*, *Phaenomonas* and *Bascanichthys* revealed no recognizable macroscopic animal material, only copious sand and gravel particles. This, coupled with observations of live specimens, led him to believe that "these eels indiscriminately eat their way through the substrate digesting any utilizable material they encounter." In addition to large quantities of sand and shell, we found polychaete worms in 24% of the stomachs examined, sipunculids in 6%, intact small crustaceans (mantis shrimp and grass shrimp) in 5% and sizeable pieces of unidentifiable animal tissue in 16%. In the present study the senior author observed *Bascanichthys* with heads protruding from the sand both in an aquarium and in the field. These observations and the presence in the gut of intact epibenthic crustaceans suggest that *Bascanichthys* actively seeks and captures live prey. The relative importance of hunting for live prey in and out of the substrate, as opposed to random opportunistic feeding as suggested by McCosker, cannot be determined from the limited data.

Gonads of *Bascanichthys* are paired dorsomedial organs that arise adjacent to the liver and terminate posterior to the anus. Unripe ovaries resemble fat bodies attached to the dorsomedial mesentery. Histological examination showed that the ovary is composed primarily of fat cells interspersed with early stage oocytes. Unripe testes look like thickened ventral extensions of the dorsomedial mesentery. The sex of specimens < 200 mm TL and size at sexual maturity could not be determined by gross examination. Gonads of 140 females (201–800 mm TL) and 66 males (201–600 mm TL) were examined. Females tended to be larger and were more numerous than males. Thirty-two % of the females, but only 11% of the males, were > 450 mm TL. No males were > 600 mm TL, but 6% of the females were 600 to 800 mm TL. Of 140 females of both species examined, 15 were gravid; the smallest gravid female was a 471 mm TL *B. scuticaris*. Twelve of these 15 were taken on the surface at night; in four collections containing seven ripe females (6 *B. scuticaris*, 1 *B. bascanium*), one or more males with much enlarged testes were also taken. The smallest was a 356 mm TL *B. scuticaris*. All ripe female *B. scuticaris* were taken between 30 December and 28 February. The single ripe female *B. bascanium* was taken 27 January.

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