

Northeast Gulf Science

Volume 3
Number 2 *Number 2*

Article 3

12-1979

Additional Marine Fishes New or Rare to Carolina Waters

George H. Burgess
University of Florida

Garnett W. Link Jr.
University of North Carolina

Stephen W. Ross
University of North Carolina

DOI: 10.18785/negs.0302.03

Follow this and additional works at: <https://aquila.usm.edu/goms>

Recommended Citation

Burgess, G. H., G. W. Link Jr. and S. W. Ross. 1979. Additional Marine Fishes New or Rare to Carolina Waters. *Northeast Gulf Science* 3 (2).

Retrieved from <https://aquila.usm.edu/goms/vol3/iss2/3>

This Article is brought to you for free and open access by The Aquila Digital Community. It has been accepted for inclusion in *Gulf of Mexico Science* by an authorized editor of The Aquila Digital Community. For more information, please contact Joshua.Cromwell@usm.edu.

ADDITIONAL MARINE FISHES NEW OR RARE TO CAROLINA WATERS

George H. Burgess
Florida State Museum
University of Florida
Gainesville, FL 32611
and

Garnett W. Link, Jr. and Stephen W. Ross¹
Department of Zoology
University of North Carolina
Chapel Hill, NC 27514

ABSTRACT: Twenty marine fishes are reported for the first time from the waters of North or South Carolina, and seven additional species considered rare in these waters are also recorded. Gonadal condition and stomach contents of the largest known female *Scyliorhinus meadi*, a rare scyliorhinid shark, are described for the first time. Many additional records of *Fistularia petimba* from throughout its distributional range are included, and food habits of 15 North Carolina specimens are examined. Nine additional adults and subadults of the uncommon priacanthid *Cookeolus boops* are reported, and coloration of a subadult is recorded.

Few coastal regions of the western Atlantic have been as well studied as that of the Carolinas. The historical presence of numerous marine laboratories, as well as extensive government sponsored surveys of the region (e.g., Anderson and Guthertz, 1965; Bullis and Thompson, 1965; Fahay, 1975; Wilk and Silverman, 1976), have been instrumental in developing our present knowledge of the fishes. Nevertheless, ongoing sampling continues to yield species new to the area (McEachran and Eschmeyer, 1973; Burgess and MacPherson, 1975; Anderson *et al.*, 1975; Ross and Fast, 1977), 20 of which are included in this report. In addition, the occurrence of seven species considered rare in North and South Carolina waters is also recorded.

Specimens cited are deposited in the collections of the Academy of Natural Sciences of Philadelphia (ANSP), Duke University Marine Laboratory (DUML),

Gulf Coast Research Laboratory (GCRL), Florida State Museum, University of Florida (UF), University of Miami (UMML), University of North Carolina Institute of Marine Sciences (UNC), and the National Museum of Natural History, Smithsonian Institution (USNM). All measurements are expressed in standard length unless otherwise indicated.

SCYLIORHINIDAE

Scyliorhinus meadi Springer. Springer (1966) described this species from six specimens taken in 329-549 m from off northern Florida and the Bahamas. Springer and Sadowski (1970) later added a seventh specimen while relegating *meadi* to a subspecies of *S. retifer* but were unable to expand its distributional range. In his recent monograph, Springer (1979) re-elevated *meadi* to the species level and reported on the largest known specimen, a 490 mm immature male from off Cape Fear, North Carolina. He noted that *S. meadi* must be a large species, larger than any other western North Atlantic scyliorhinid, and speculated that the North Carolina specimen may eventually prove to be an adult

¹Present address:

North Carolina Division of Marine Fisheries
Morehead City, NC 28557

female, despite the presence of partially developed claspers. We have a second individual (385 mm total length, UF 25544) collected at 34° 12.7'N, 75° 51.5'W (450 m water depth) on 30 October 1966. This catshark, the largest female so far recorded, lacks claspers and contains no advanced stage ova in either ovary. The elongate right ovary lies lateral to the spiral valve and is larger (33.2 mm in length) than the left (8.9 mm), which lies more anteriorly at the confluence of the stomach and spiral valve. The reproductive condition and size of the specimen suggests that Springer (1979) was correct in regarding this as a large species. It seems possible that some geographical size segregation may occur in the species as well, since the size of Florida-Bahama specimens ranges from 180-270 mm TL, while the two North Carolina examples are considerably larger (385-490 mm TL). There is no particular size or sex related depth stratification evident among the eleven known (all immature) specimens, but the possibility that sexually mature adults inhabit deeper waters bears watching. Springer and Sadowsky's (1970) belief that this is primarily a Bahamian form may be erroneous since only two individuals are known east of the Florida Current. The stomach of our specimen contains large numbers of cephalopod beaks, several cephalopod suckers and egg cases, and two euphausiids.

OPICHTHIDAE

Apterichtus ansp (Böhlke). The eel genus *Apterichtus*, which until recently was known by the name *Verma* (McCosker, 1977), is represented in the western Atlantic by two species, *ansp* and *kendalli*. A 163 mm TL (UNC 7776) *A. ansp* (with 125 vertebrae), collected at 33° 54'N, 76° 31.9'W (38 m) on 25 June 1972, constitutes the first North

Carolina record of the species. Identification of this and other *Apterichtus* specimens was based primarily on vertebral counts (123-132 in *ansp*, 137-144 in *kendalli*; Böhlke, 1968). Böhlke (1968) recorded the Academy eel from the Bahamas and the Lesser Antilles, and listed specimens from the Florida Keys and South Carolinas as "probably" this form. Fahay and Obenchain (1978) recently reported the capture of a single *A. ansp* leptocephalus from off South Carolina. Ten additional adult specimens (UF 24900, 24902, 24904-24907) were taken at six stations off South Carolina (31° 50'-58'N, 79° 41'-48'W; 36.6-45.7 m) on 18-21 January 1978. Vertebral counts of the 178-291 mm TL specimens ranged from 126-132.

Apterichtus kendalli (Gilbert). On 6 June 1965 a 171 mm TL *A. kendalli* (DUML 1851) was captured in a dredge at 34° 08'N, 76° 11.8'W in 56 m of water. Total vertebral count of this North Carolina specimen is 140. Adult finless eels were previously reported from Venezuela, the Bahamas, Florida (Böhlke, 1968), and South Carolina (Dawson, 1959), and Fahay and Obenchain (1978) took leptocephali from as far north as off Cape Hatteras, North Carolina.

Ophichthus ophis (Linnaeus). Adults of the spotted snake eel have appeared irregularly in collections from the eastern Gulf of Mexico (Smith *et al.*, 1975), Venezuela (Cervignon, 1973), Curaçao, Brazil, Cuba, Bermuda and southern Florida (Böhlke and Robins, 1959). Fahay and Obenchain (1978) reported the capture of 44 *O. ophis* leptocephali from numerous localities ranging from Ft. Pierce, Florida to an offshore area southeast of Cape Fear, North Carolina. They suggested that cold water incursions in winter months prevent establishment of adults north of Cape Kennedy, Florida. We have trawl records of

three adults from North Carolina waters, thereby establishing that transforming juveniles are able to settle this far north: 1 (810 mm TL, UF 24588), 34°00'N, 77°24'W, 23.8 m, 15 Nov. 1977; 1 (915 mm TL, UNC 4284), 33°38.8'N, 76°48.8'W, 58.5 m, 5 Sept. 1968; and 1 (643 mm TL, UF 24587), 33°06'N, 77°51'W, 54.9 m, 9 Nov. 1977. *O. ophis* is one of the largest members of the genus and is apparently confined to hard-bottom habitats. It is likely that this species is more common than literature records suggest, since its morphology and habits probably make most captures of adults fortuitous.

ENGRAULIDAE

Engraulis eurystole (Swain and Meek). A single Beaufort specimen, taken in 1913, long represented the sole North Carolina record of the silver anchovy (Hildebrand, 1963). Fahay (1975) recorded without comment the capture of a second individual from off Cape Fear (33°28'N, 77°49.5'W). A total of 73 specimens of this species was trawled on three occasions: 62 (78-97 mm, UNC 11786), entrance to Barden Inlet at Cape Lookout (34°37.5'N, 76°32.5'W), 30 March 1976; 10 (50-66 mm, UNC 11916), 3.2 km off Shackleford Banks, between Cape Lookout and Beaufort Inlet, 20 July 1976; and 1 (88 mm, UF 255-45), 33°32'N, 77°49'W, 21.9 m, 17 October 1977. *E. eurystole* had been considered a northern species with North Carolina forming its southern limit, but recent captures of silver anchovies from the east coast of Florida (Daly, 1970; Futch and Dwinell, 1977) and the Gulf of Mexico (see compilation in Hastings, 1977) substantially extend its range south and westward. Furthermore, Whitehead (1973) synonymized the southern (Venezuela to northern Brazil) form, *Engraulis estanquae* Hildebrand, with *E. eurystole*, making *E. eurystole* one of the widest ranging

western Atlantic engraulids. Additional study of the range of meristic variability and changes with allometric growth is required for this species, since neither our nor Hastings' (1977) specimens precisely match the description in Hildebrand (1963).

ARGENTINIDAE

Argentina striata (Goode and Bean). The largest single Atlantic coast collection (78: 29-96 mm, UNC 7993) of this species was taken on 3 December 1972 in 182-185 m, from off South Carolina (32°52'-53'N, 77°56'-54'W). Although *A. striata* ranges from Nova Scotia to Brazil (Cohen and Atsides, 1969), it has not been documented as occurring between Virginia (37°N, 74°W; Schroeder, 1955) and northern Florida (29°59'N, 80°07'W; Cohen and Atsides, 1969). Struhsaker (1969) recorded this argentine as "rare" from lower shelf waters off the southeastern United States, but listed no precise localities. Since *A. striata* should be included in future editions of the American Fisheries Society list of common and scientific names of fishes from the United States and Canada (Bailey *et al.*, 1970), we favor retaining the common name "striated argentine" used by Liem and Scott (1966).

Glossanodon pygmaeus (Cohen). Eight specimens of this small argentine were retained from two trawl collections made off North Carolina: 5 (31.2-40.4 mm, UF 25228), 33°41'N, 76°42'W, 153.6 m, 19 May 1978; and 3 (49.0-65.2 mm, UF 25232), 33°26'N, 76°58'W, 170.1 m, 19 May 1978. Many additional badly mangled specimens were not saved. *G. pygmaeus* has been captured near the continental shelf break from off South Carolina (32°58'-56'N, 77°52'-56'W) to Brazil, including the Gulf of Mexico and Caribbean (Cohen, 1958, 1964). "Pygmy argentine" is proposed as a common

name for this species for inclusion in the American Fisheries Society list of common and scientific names.

EXOCOETIDAE

Hemiramphus balao Lesueur. Collette (1965) listed the western Atlantic distribution of the balao as from off New York south throughout the Gulf of Mexico and the Caribbean Sea to Santos, Brazil, but this species has not been recorded from North Carolina. A juvenile *H. balao* (60 mm, UNC 10165) was dipnetted from among floating *Sargassum* at 34°44.5'N, 75°22.5'W on 16 July 1975. Juveniles of this species and *Hemiramphus brasiliensis* are pelagic and are carried by the Gulf Stream north of the normal ranges of the adults (Collette, 1962).

Hirundichthys affinis (Günther). Nichols and Breder (1927) questionably recorded this flyingfish from Woods Hole and New York, noting some confusion with *Exocoetus volitans*. Breder (1938) subsequently indicated that single specimens collected offshore of southern Virginia and Bermuda were the northernmost records of the species, and Briggs (1958) listed its distribution as from Virginia to northern Brazil, including the Gulf of Mexico. A 59.8 mm (UNC 10164) individual of the fourwing flyingfish, dipnetted from under the same *Sargassum* patch that yielded the above *Hemiramphus balao*, serves to substantiate this species' occurrence in North Carolina.

ANOLOGASTERIDAE

Anoplogaster cornuta (Valenciennes). The first North Carolina specimen (128.1 mm, UF 25133) of the fangtooth was collected on 5 September 1972 at 34°13.0'-09.4'N, 75°33.4'-32.3'W at a depth of 2710-2830 m. In the western North Atlantic this cosmopolitan deep-water (640-4898 m) species has also

been reported from off New Jersey, Bermuda, northern Florida, and the Gulf of Mexico (Woods and Sonoda, 1973).

FISTULARIIDAE

Fistularia petimba Lacépède. The red coronetfish, *F. petimba*, has often been confused with its congener, *F. tabacaria*, in the past, so an accurate delineation of the red coronetfish's distribution is lacking. Fritzsche's (1976) revision of the genus listed specimens from Venezuela and Massachusetts, and his distribution map included records from north of Cuba and Brazil. While comparing *F. petimba* from North and South Carolina with material in the Florida State Museum we discovered a number of additional localities for the species, which are also listed here: 1 (374 mm, UF 24500), 41°12'N, 71°38'W (Block Island, Rhode Island), 6 November 1971; 1 (580 mm, UF 29903), 35°01'N, 75°13'W (N.C.), 329 m, 15 June 1957; 1 (437 mm, UF 29895), 34°10'N, 76°15'W (N.C.), 40 m, 7 September 1959; 3 (525-717 mm, UF 24613), 34°07'N, 76°22'W (N.C.), 42.5 m, 12 December 1977; 2 (623-658 mm), 33°52'N, 76°46'W (N.C.), 40.2 m, 16 May 1978; 10 (482-908 mm, UF 24615), 33°52'N, 76°38'W (N.C.), 44.4 m, 13 December 1977; 1 (563 mm), 33°47'N, 76°57'W (N.C.), 42.1 m, 18 May 1978; 2 (605-677 mm, UF 29895), 33°44'N, 76°58'W (N.C.), 40-42 m, 3 September 1959; 2 (831-1086 mm), 33°44'N, 76°54'W (N.C.), 42.1 m, 21 May 1978; 4 (634-918 mm), 33°44'N, 76°45'W (N.C.), 49.4 m, 18 May 1978; 1 (520 mm, UF 29897), 33°43'N, 76°43.5'W (N.C.), 46 m, 9 December 1959; 1 (680 mm), 33°33'N, 76°49'W (N.C.), 42.1 m, 20 May 1978; 3 (762-992 mm), 33°27'N, 77°18'W (N.C.), 40.2 m, 20 May 1978; 2 (708-1010 mm), 33°22'N, 77°13'W (N.C.), 51.2 m, 20 May 1978; 1 (645 mm, UF 26664), 33°00'N, 78°09'W (S.C.), 42.1 m, 26 June 1978; 1 (718 mm,

UF 24614), 32°58'N, 78°02'W (S.C.), 75 m, 8 November 1977; 1 (509 mm, UF 29898), 32°58'N, 78°13'W (S.C.), 42-46 m, 20 October 1959; 1 (570 mm, UF 29899), 32°02'N, 79°23'W (S.C.), 64 m, 14 December 1961; 1 (585 mm, UF 29900), 31°50'N, 79°33'W (S.C.), 64 m, 12 December 1963; 1 (985 mm, UF 12009), approximately 72.4 km southeast of Mayport (Atlantic Florida), 61 m, February 1974; 1 (655 mm, UF 29902), 24°44'N, 80°43'W (Straits of Florida), 55 m, 26 October 1960; 1 (144 mm, UF 24503), 17°50.5'N, 77°37.5' (Jamaica), 20.1-23.8 m, 18 May 1965; 2 (254-261 mm, UF 24502), 11°30'-12 00'N, 63°30'-64°00'W (Venezuela), 60.4 m, 20 July 1968; 1 (624 mm, UF 29901), 09°18'N, 80°25'W (Atlantic Panama), 137 m, 29 May 1962; and 1 (245 mm, UF 24501), 08°56'N, 80°57'W (Atlantic Panama), 91.4 m, 30 May 1962.

The Jamaica specimen, the smallest examined, had not yet developed the diagnostic spinose posterior lateral line scales, but did possess mid-dorsal bony plates (visible only after dissection) and serrated snout ridges. A 16 mm *Haltichoeres radiatus* was removed from

its snout. Hiatt and Strasburg (1960) and Hobson (1968, 1974) found that Pacific *F. petimba* fed totally on fish, but our examination of the stomach contents of 15 N.C. specimens reveals that the species is not exclusively piscivorous (Table 1). Fishes were the most common food items, but squid (*Lolligunculus brevis*) and shrimp (*Sicyonia* sp.) were also taken; this is similar to the feeding habits of *F. tabacaria* (Randall, 1967b; Burgess, 1976). The presence of both demersal (e.g., *Sicyonia* sp., *Prionotus alatus*) and pelagic (*Sardinella* sp., *Peprilus triacanthus*) species in the diet of *F. petimba* suggests that feeding occurs over a range of depths and habitats.

Based on the above records, *F. petimba* is not a rare species in the western Atlantic and in fact, probably is as common as *F. tabacaria*. Ecological separation of these two species is largely based on depth preferences, with *F. petimba* the offshore replacement of the nearshore *F. tabacaria*.

SYNGNATHIDAE

Micrognathus crinitigerus (Bean and

TABLE 1. — Stomach contents of 15 *Fistularia petimba* captured in North Carolina waters (33°22'-33°52'N, 76°46'-77 18'W), 16 - 21 May 1978.

Length (mm)	Weight (g)	Sex	Stomach Contents
563	103	F	Remains of two unidentified fishes
623	158	F	Remains of four or five fishes (<i>Centropristis ocyurus</i>)
634	164	M	One squid (<i>Lolligunculus brevis</i>)
658	178	F	One <i>C. ocyurus</i> (17 mm), other unidentified fish remains
680	206	F	Two <i>L. brevis</i>
708	238	F	Ten fishes (<i>Peprilus triacanthus</i> , 18-39 mm)
730	284	F	Three fishes (one <i>Hemipteronotus novacula</i> , 73 mm; one labrid; one bothid)
762	302	M	Remains of unidentified fish larvae
798	368	F	One shrimp (<i>Sicyonia</i> sp.), one <i>L. brevis</i> , three fishes (one <i>Prionotus alatus</i> , 23 mm; one bothid, 40 mm; one unidentified larva), one small rock
831	384	M	Empty
918	620	M	Empty
936	720	F	Fish remains (Stromatidae)
992	840	F	Sixteen fishes (one <i>Diplectrum formosum</i> , 133 mm; 15 <i>P. triacanthus</i> , 20-36 mm)
1010	780	F	Fifty-one fishes (49 <i>P. triacanthus</i> , 20-41 mm; two unidentified larvae)
1086	1090	F	One fish (<i>Sardinella</i> sp., 150 mm); other unidentified fish remains

Dresel). Formerly known from southern Florida and the Bahamas to Brazil, including the Gulf of Mexico (Böhlke and Chaplin, 1968), the fringed pipefish may now be included in North Carolina ichthyofauna based on a 56 mm male (UNC 9066) captured by otter trawl on 18 February 1974 in the estuarine waters of Core Creek (34°47'N, 76°41.2'W). Since it is highly unlikely that this warmwater, sedentary species could overwinter in North Carolina, we think our specimen must have drifted inshore from Gulf Stream waters while rafting with floating vegetation.

SCORPAENIDAE

Scorpaena dispar Longley and Hildebrand. The hunchback scorpionfish has been reported from South Carolina southward throughout the Gulf of Mexico to Venezuela and Brazil in depths of 36.5-173.7 m (Ginsburg, 1953; Eschmeyer, 1969). We have three records of *S. dispar* that extend its range into North Carolina: 1 (237 mm, UNC 12820), off Cape Hatteras, June 1977; 2 (97-115 mm, UF 25546), 34°14.5'N, 76°53.5'W, 30.5 m, 23 June 1978; and 1 (106.9 mm, UF 24818), 33°58'N, 76°23'W, 81.1 m, 13 December 1977.

Scorpaena isthmensis Meek and Hildebrand. Only six specimens of the smoothcheek scorpionfish have been reported from United States waters, five from off northern Florida and one from North Carolina (34°25.5'N, 76°19'W; McEachran and Eschmeyer, 1973). On 14 February 1978 two *S. isthmensis* (99.1-151.0 mm, UF 24908) were collected approximately 37.0 km southeast of Cape Hatteras. While precise locality data are lacking, this represents the northernmost record of the species. Our capture of an additional North Carolina specimen (87 mm, UNC 8224) from a scallop bed off Cape Lookout (34°28.8'N,

76°16'W; 32 m) on 23 May 1973 was recorded in Schwartz and Porter (1977), but we include it here since full collection data were omitted. This species may ultimately prove to be more common than formerly thought when appropriate substrates are adequately sampled.

PERISTEDIIDAE

Peristedion gracile Goode and Bean. The slender sea robin has been captured off New Jersey (Fowler, 1952) and northern Florida (Bullis and Thompson, 1965), but none have been noted from North Carolina. Nevertheless *P. gracile* is a common armored sea robin in moderately deep (98-155 m) North Carolina waters. Four North Carolina records are included here, while an additional Virginia specimen, unavailable for study, is also present at the University of North Carolina Institute of Marine Sciences: 1 (83 mm, UF 25547), 35°44'N-35°45'N, 34°51'-74 51'W, 133.5-155.4 m, 17 September 1974; 11 (64-88 mm, UNC 9087), 35°43'-41'N, 74°50'-51'W, 98-109 m, 22 May 1974; 1 (96.0 mm, UF 26693), 34°36'N, 75°42'W, 135.3 m, 23 October 1978; and 1 (72 mm, UF 25548), 33°41'N, 76°42'W, 153.6 m, 19 May 1978.

Peristedion thompsoni Fowler. Rimspine sea robins were caught off North Carolina on two occasions: 1 (91 mm, UF 25549), 36°15'-14'N, 74°48'50'W, 93-151 m, 18 September 1974; and 1 (82 mm, DURL 2684), 34°23'N, 75°51.5'W, 171 m, 25 July 1965. This species has previously been taken from South Carolina to Brazil, including the Gulf of Mexico and Caribbean (G. C. Miller, *in lit.*), in moderately deep (93-171 m) water.

SERRANIDAE

Anthias nicholsi Firth. Firth's (1933) original description of this species was based on four Virginia specimens, and Nichols and Firth (1936) and Fowler

(1937) subsequently recorded it from off Cape May, New Jersey. W.D. Anderson, who is studying the systematics of western Atlantic anthiine serranids, reports (pers. comm.) that *A. nicholsi* ranges from off Atlantic City, New Jersey (ANSP 101557) to Brazil (02°04'N, 47°00'W) but is absent from the Caribbean. Bullis and Thompson (1965) questionably listed the only North Carolina (34°04'N, 76°15'W) collection of the species. We include here a number of additional North Carolina records, several kindly supplied by W.D. Anderson: 1 (59.2 mm, UF 24523), 35°45'N, 74°50'-51'W, 133-155 m, 17 Sept. 1974; 1 (135 mm, USNM 143057), 35°38'N, 74°53'W, 20 Oct. 1884; 1 (136 mm, USNM 37388), 35°08'N, 75°05.5'W, 17 Oct. 1885; 1 (76 mm, UMML 30345), 35°06'N, 75°08.5'W, 182.9 m, 23 Feb. 1960; 20 (UNC uncat.), 33°49'N, 76°85'W, 73.2-84.1 m, 25 Sept. 1969; and 19 (107-173 mm, UF 24524), 32°50'N, 77°58'W, 188.4 m, 8 Dec. 1977. The 59.2 mm specimen was removed from a crevice in a large chunk of marl; fresh coloration was similar to that described by Fowler (1937). These additional collections demonstrate that *A. nicholsi* is not uncommon in deeper (73-188 m) North Carolina waters. This species should also be included in the American Fisheries Society list of common and scientific names of fishes, and we suggest using the common name "saffron bass".

Schultzea beta (Hildebrand). The school-bass, a small denizen of deep reefs, is found from the Bahamas and southern Florida to the Lesser Antilles (Böhlke and Chaplin, 1968) and western Caribbean (Burgess and Gilbert, ms). It is therefore noteworthy that 17 specimens of *S. beta* have been trawled in waters off North Carolina: 11 (75.3-90.3 mm, UF 24919), 33°58'N, 76°23'W, 81.1 m, 13 December

1977; 1 (84.8 mm, UF 24925), 33°54'N, 76°29'W, 65.6 m, 13 December 1977; and 5 (89-100 mm), 33°48'N, 76°36'W, 62.2 m, 16 May 1978. The capture of this species provides evidence of the well developed tropical ichthyofauna inhabiting North Carolina's offshore reefs.

Serranus notospilus Longley. The range of the saddle bass was delineated by Robins and Starck (1961) as from the Florida Keys and Gulf of Mexico to Surinam. Struhsaker (1969) recorded *S. notospilus* as "rare" on the shelf-edge off the southeastern United States, but gave no exact localities of capture. We have five records of this species from off North and South Carolina: 1 (47.4 mm, UF 25128), 34°56'N, 75°24.5'W, 93-94 m, 19 July 1960; 10 (45-69 mm, UNC 4113), 34°31'N, 75°49'W, 76-95 m, 18 July 1960; 5 (53.8-74.8 mm, UF 26692), 33°06'N, 77°51'W, 65.8 m, 11 November 1978; 31 (33-68 mm, UNC 7998), 32°58.9' 59.5'N, 77°50'W, 127-136 m, 3 December 1972; and 27 (72-90 mm, UNC 7995), 32°52'-53'N, 77°54'-56'W, 182-185 m, 3 December 1972. The large numbers caught at three of these locations may indicate that the saddle bass is a permanent resident of this region.

PRIACANTHIDAE

Cookeolus boops (Bloch and Schneider). The bulleye was at one time considered quite rare in the western Atlantic (Caldwell, 1962), but recent collections (Anderson *et al.*, 1972; MacKay and Gilhen, 1973; Matthews *et al.*, 1977) have increased the known total of specimens from 6 to 46. Juveniles taken from fish stomachs make up the bulk (33) of these. We now add nine additional adults and subadults to this total, all collected in bottom trawls: 1 (95.0 mm, UNC 8222), off Chesapeake Bay, Albatross IV station 65-7, 23 October 1973; 1 (146.4 mm, UNC 6308), 36°34'N,

74°44'W, 117 m, 13 Dec. 1971; 1 (107.8 mm, UF 23800), 36°32'N, 74°44'W, 117-278 m, 27 Aug. 1974; 1 (139.1 mm, UNC 6308), 35°53'N, 74°52'W, 117 m, 14 Dec. 1971; 1 (224.5 mm, UNC 6273), 34°21.5'N, 76°08'W, 139-146.3 m, 19 Sept. 1971; 1 (207.0 mm, UNC 7191), 34°05.5'N, 76°06.5'W, 1 July 1972; and 3 (335-359 mm, UNC 4668), 32°52'N, 77°52'W, 181.1-184.7 m, 17 Sept. 1969. *C. boops* seems to be a fairly common resident of North Carolina waters, as evidenced by the number of specimens taken and the capture of as many as three individuals in a single trawl haul.

The meristics of these specimens fall within the emended ranges of Anderson *et al.* (1972), with the exception of one variation in pectoral ray count (17 in one specimen vs. 18-19). Caldwell (1962) and Anderson *et al.* (1972) briefly noted a decrease in the relative size of the pelvic spine and second pelvic ray with increased body length in this species; data from our specimens corroborate this ontogenetic change.

Coloration of a subadult (107.8 mm) was recorded after having been frozen for four days: Dorsum, interorbital, snout and tip of lower jaw black, grading into scarlet-red and silver laterally. Three black bars located under dorsal spines I-III, VI-VIII, and dorsal rays 1-6, extending ventrally to horizontal from mid-eye. Dorsal fin membranes jet black from 1st spine to 7th ray, grading posteriorly into orange. All spines and rays (except pectorals) scarlet-red to orange. Caudal fin predominantly orange, with dusky basal membranes. Anal fin membranes dusky to jet black between 1st spine and 8th ray, grading posteriorly to orange. Pelvic membranes jet black. Pectoral fin membranes and rays translucent except for 1st ray and adjacent membrane, which are dusky black. Dorsal pectoral axil with dusky

black spot. Eye orange. Interior of mouth scarlet-red. The coloration of this specimen differs from the color description of the largest known adult (507 mm; Anderson *et al.*, 1972) chiefly in the presence of lateral barring, lack of distal caudal dusky coloration, and greater predominance of black on the dorsal, anal and pelvic fins. Intermediate sized specimens illustrated in Caldwell (1962: 158 mm, UF 23801) and Fritzsche (1978: 169 mm) show more obscure barring, less black in the anal fin, and the distal caudal dusky (in the 158 mm fish).

GERREIDAE

Diapterus auratus Ranzani. The Irish pompano is frequently collected from Cape Lookout southward during the summer and fall. *D. auratus* (*D. olisthottomus* of earlier authors; Deckert, 1973) has been taken in Chesapeake Bay (Musick, 1972) but apparently has not been reported from North Carolina because of the confused taxonomic status of western Atlantic gerreids. K. A. MacPherson has provided us with information on two collections of juvenile *D. auratus* from the intake screens of the Brunswick Steam Electric Plant in Southport, N.C.: 7 (36.6-48.2 mm, UF 26665), 28 Oct. 1974; and 2 (48-55 mm), 26 Oct. 1974. A 214.8 mm (UF 25550) Irish pompano collected by M. Wolff in Pamlico River during the summer of 1974 is near maximum size for the species; G. Gilmore (pers. comm.) has recorded 250 mm specimens from Indian River, Florida. Our experience with this species in North Carolina suggests that young are recruited annually during warm seasons, but overwinter.

SCARIDAE

Sparisoma rubripinne (Valenciennes). In 1927 Nichols and Breder reported the capture of a single specimen of this

parrotfish (as *S. flavescens*) from Buzzard's Bay, Massachusetts, and it remains the northernmost record of the species. The redfin parrotfish is most common, however, from Bermuda, the Bahamas and Florida to Brazil, including the western Caribbean (Böhlke and Chaplin, 1968). Since no published records exist for the occurrence of *S. rubripinne* in North Carolina, we note here two specimens (115 and 45 mm, UF 24913-24914) taken by M. Wolff in an eelgrass (*Zostera marina*) bed in Teaches Hole Channel, near Ocracoke Inlet (34°04'N, 76°01'W; 2 m) on 17 September and 22 October 1973.

DACTYLOSCOPIDAE

Dactyloscopus sp. Two specimens of a laterally compressed sand stargazer, genus *Dactyloscopus*, were captured in Onslow Bay, North Carolina: 1 (64 mm, UF 24428), 34°22'N, 77°04'W, 20.1 m, 11 Aug. 1977; and 1 (68 mm, GCRL 16271), 34°32'N, 76°52'W, 20.1 m, 19 Sept. 1978. C.E. Dawson, who is revising the genus, informs us that these fishes may be referable to *D. moorei*, a poorly known species described by Fowler (1906) from Florida, or may represent an undescribed species. He notes that he has seen other specimens of this form from South Carolina, Georgia and the east coast of Florida. The capture of sand stargazers in large trawls is an extremely fortuitous event considering the small size of the fishes and their presumed habits of burrowing in the substrate; thus our collections of two equal-sized *Dactyloscopus* sp. from the identical depth, same season, and nearby localities suggests that this species may be a permanent resident of appropriate offshore habitats in North Carolina.

AMMODYTIDAE

Ammodytes americanus DeKay. The American sand lance, a boreal species

most commonly distributed from Virginia (Norcross, *et al.*, 1961) to Cape Chidley, Labrador (Bigelow and Schroeder, 1953), has not been reported from North Carolina since Jordan and Evermann (1896) listed the southern limit of its range as Cape Hatteras. A single *A. americanus* (41 mm, UNC 14953) was taken by W.E. Fahy and R.A. Davis in a night plankton tow in Barden Inlet at Cape Lookout (34°38'N, 76°31.5'W) on 11 April 1960, and two 45 mm TL specimens were trawled by M. Wolff in Davis Channel, Oregon Inlet (35°45.5'N, 75°33'W) on 3 April 1974. These collections reaffirm the presence of the species in the state and extend its range slightly southward. At capture the specimens were probably about four months of age, based on the 11.7 mm/month growth rate calculated by Norcross *et al.* (1961). This indicates a mid-December spawning, which agrees with the November to May spawning season noted by these workers for Virginia fish. The absence of collections of sand lance larvae from south of Cape Lookout (Fahay, 1975), plus the abundance of the same north of False Cape, Virginia, (Norcross, *et al.*, 1961) suggests that our specimens were strays that had drifted south of their spawning sites.

GOBIIDAE

Ioglossus calliurus Bean. Randall (1967a) reported the blue goby only from Florida, but Radcliffe (1914) had earlier recorded the capture of a single specimen of this species from the "Beaufort region". It is also known from an offshore reef in the western Gulf of Mexico (Hoese and Moore, 1977). Three additional individuals of this burrowing form have been recently obtained, all egested from the stomachs of larger fishes: 1 (50 mm, UNC 8500), off Bogue Banks near "WR 13" wreck (34°33'N, 76°53.5'W), 26 May 1973; 1 (65 mm, UNC 12345), 34°23.8'N,

76°35'W, 24 m, 2 October 1976; and 1 (39.1 mm, UF 25127), 34° 09.6'N, 76°49.7'W, 32 m, 3 July 1973. Diving observations by one of us (S.W.R.) reveals that *I. callitrus* is a common benthic dweller in offshore North Carolina reef areas. Aspects of its ecology will be reported in more detail in a forthcoming paper on the ichthyofauna of these reefs.

BALISTIDAE

Cantherhines macrocerus (Hollard). *C. macrocerus* ranges from Bermuda, the Bahamas and northern Florida to Brazil (Randall, 1964; Bohlke and Chaplin, 1968), including the western Gulf of Mexico (Bright and Cashman, 1974). Young are occasionally taken in floating *Sargassum* (Dooley, 1972), but the preferred habitat is "clear water on coral reefs at depths from 8 to 70 feet" (= 2.5-22.2 m) (Randall, 1964). Two collections demonstrate that *C. macrocerus* occurs in both habitats in North Carolina: 2 (41.4-48.5 mm, UF 24620), 34°14'N, 76°03'W, surface, 15 Sept. 1959; and 1 (137.7 mm, UF 24924), 33°57'N, 76°43'W, 40.2 m, 13 Dec. 1977.

DIODONTIDAE

Diodon holacanthus Linnaeus. Bohlke and Chaplin (1968) listed the range of the balloonfish as from Florida and the Bahamas to Brazil, including the western Caribbean, and Dahlberg (1975) recorded it from Georgia. We have records of 13 specimens of *D. holacanthus* from North and South Carolina: 1 (42.4 mm, UF 24429), 34°39'N, 76°00'W, 36.6 m, 24 Aug. 1977; 1 (41.8 mm, UF 25136), 34°09'N, 75°24'W, surface, 29 Sept. 1954; 1 (53 mm, UNC 4293), 34°02'N, 76°16.1'W, surface, 4 Sept. 1968; 1 (141 mm, UF 25551), 33°48'N, 76°36'W, 62.2 m, 16 May 1978; 4 (135-165 mm, UF 26649), 33°38'N, 76°58'W, 42.2 m, 21 May 1978; 1 (25 mm, UF 25132), 33°34'N, 76°36'W, surface, 6 April 1965; 1 (49 mm,

UNC 4292), 33°29.7'N, 76°53.9'W, surface, 5 Sept. 1968; 1 (13 mm, UF 25130), 33°25'N, 76°58.5'W, surface, 10 April 1964; 1 (46.3 mm, UF 25135), 33°14'N, 76°25'W, surface, 27 Sept. 1954; and 1 (43.5 mm, UF 25134), 31°40'N, 78°58'W, surface, 2 July 1954. Four diodontids (*D. holacanthus*, *D. hystrix*, *Chilomycterus schoepfl.*, *C. antillarum*) are now known from North Carolina.

SUMMARY

Of the 27 species reported herein, 22 were captured in or over waters deeper than 20 m. Most have apparently previously escaped collection because substrate and/or depth preferences have made sampling difficult. Since *Micrognathus crinitigerus* is a tropical, inshore form not thought to utilize rafts of Gulf Stream vegetation as a normal means of dispersal, it is probably rare as far north as the Carolinas. Other species included here, however, could be expected to appear with some regularity in Carolina waters or may be permanent residents of the area. Further sampling of offshore reef areas, especially using SCUBA and chemical ichthyocides, will surely yield additional species unreported from this region.

ACKNOWLEDGMENTS

We thank curators J.E. Böhlke (ANSP), C.E. Dawson (GCRL), C.R. Gilbert (UF), W. Kirby-Smith (DUML), E.A. Lachner (USNM), C.R. Robins (UMML), and F.J. Schwartz (UNC) for use of museum collections. W.D. Anderson, J.E. Böhlke, C.E. Dawson, G.R. Gilmore, C.L. Hubbs, F.J.S. Maturo, G.C. Miller, S. Springer, D.J. Stewart and W.H. Wilson verified identifications or communicated information. W.E. Fahy, J. Gillikin, L.H. Hardy, B.F. Holland, G. Huntsman, S. Keefe, K.A. MacPherson, A.B. Powell, M. Wolff, and W. Woods graciously provided specimens.

Cruise participation aboard the R/V *Dan Moore* was made possible by E. McCoy, B.F. Holland and A.B. Powell of the North Carolina Division of Marine Fisheries; aboard the R/V *Atlantic Twin* by the National Marine Fisheries Service, Sandy Hook Laboratory; and aboard the R/V *Eastward* by R.T. Barber of Duke University Marine Laboratory. C.R. Gilbert reviewed the manuscript. Support of the University of North Carolina Institute of Marine Sciences is acknowledged.

LITERATURE CITED

- Anderson, W.D., D.K. Caldwell, J.F. McKinney and C.H. Farmer. 1972. Morphological and ecological data on the priacanthid fish *Cookeolus boops* in the western North Atlantic. *Copeia* 1972(4): 884-885.
- _____, and E.J. Gutherz. 1965. New Atlantic coast ranges for fishes. *Quart. Jour. Fla. Acad. Sci.* 27(4): 299-306.
- _____, J.F. McKinney and W.A. Roumillat. 1975. Range extensions for, and an abnormality in, scorpaenid fishes collected off the Carolinas. *Fla. Sci.* 38(3):171-173.
- Bailey, R.J., J.E. Fitch, E.S. Herald, E.A. Lachner, C.C. Lindsey, C.R. Robins and W.B. Scott. 1970. A list of common and scientific names of fishes from the United States and Canada (Third Edition). *Am. Fish. Soc. Sp. Publ.* 6, 150 p.
- Bigelow, H.B. and W.C. Schroeder. 1953. *Fishes of the Gulf of Maine*. U.S. Fish Wildl. Serv., Fish. Bull. 53(74):1-577.
- Böhlke, J.E. 1968. A new species of ophichthid eel genus *Verma* from the west Atlantic, with comments on related species. *Not. Nat.* 415, 12 p.
- _____, and C.C.G. Chaplin. 1968. *Fishes of the Bahamas and Adjacent Tropical Waters*. Livingston Publ. Co., Wynnewood, Pa., 771 p.
- _____, and C.R. Robins. 1959. The characters and synonymy of the western Atlantic snake eel, *Ophichthus ophis* Linnaeus. *Not. Nat.* 320, 9 p.
- Breder, C.M. 1938. A contribution to the life histories of Atlantic Ocean flying-fishes. *Bull. Bingham Oceanogr. Coll.* 6(5):1-126.
- Briggs, J.C. 1958. A list of Florida fishes and their distribution. *Bull. Fla. State Mus., Biol. Sci.* 2(8):223-318.
- Bright, T.J. and C.W. Cashman. 1974. *Fishes*. Pp. 339-410. In: T.J. Bright and L.H. Pequegnat (eds.), *Biota of the West Flower Garden Bank*, Gulf Publ. Co., Houston, Texas.
- Bullis, H.R. and J.R. Thompson. 1965. Collections by the exploratory fishing vessels *Oregon*, *Silver Bay*, *Combat*, and *Pelican* made during 1956-1960 in the southwestern North Atlantic. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 510, 130 p.
- Burgess, G.H. 1976. Aquarium feeding behaviors of the cornetfish, *Fistularia tabacaria* and the southern stargazer, *Astrocopus y-graecum*. *Fla. Sci.* 39(1):5-7.
- _____, and K.A. MacPherson. 1974. Northern range extension of the plumed scorpionfish, *Scorpaena grandicornis* (Pisces, Scorpaenidae). *Chesapeake Sci.* 15(3):162-163.
- Caldwell, D.K. 1962. Western Atlantic fishes of the family Priacanthidae. *Copeia* 1962(2):417-424.
- Cervignon, F. 1973. Los peces marinos de Venezuela. Complemento III. *Contrib. Cientif. U.D.O.*, 70 p.
- Cohen, D.M. 1958. A revision of the fishes of the subfamily Argentininae. *Bull. Fla. State Mus., Biol. Sci.* 3(3):93-100.
- _____. 1964. Suborder Argentinioidea. Pp. 1-70. In: Bigelow, H.B. (Ed.), *Fishes of the Western North Atlantic*, Mem. Sears Found. Mar. Res. 1, Pt. 4.

- _____ and S.P. Atsaiades. 1969. Additions to a revision of argentine fishes. U.S. Fish. Wildl. Serv., Fish. Bull. 68(1):13-36.
- Collette, B.B. 1962. *Hemiramphus bermudensis*, a new halfbeak from Bermuda, with a survey of endemism in Bermudian shore fishes. Bull. Mar. Sci. Gulf Caribb. 12(3):432-449.
- _____ 1965. Hemiramphidae (Pisces, Synentognathi) from tropical West Africa. Atlantide Rep. 8:217-237.
- Dahlberg, M.D. 1975. Guide to Coastal Fishes of Georgia. Univ. of Georgia Press, Athens, 186 p.
- Daly, R.J. 1970. Systematics of southern Florida anchovies (Pisces: Engraulidae). Bull. Mar. Sci. 20(1):70-104.
- Dawson, C.E. 1959. Records of three marine fishes new to South Carolina. Copeia 1959(4):343.
- Deckert, G.D. 1973. A systematic revision of the genera *Diapterus* and *Eugerres*; with the description of a new genus, *Schizopterus* (Pisces: Gerreidae). M.Sc. Thesis, Univ. So. Illinois, DeKalb.
- Dooley, J.K. 1972. Fishes associated with the pelagic sargassum complex, with a discussion of the sargassum community. Contr. Mar. Sci. Univ. Texas 16:1-32.
- Eschmeyer, W.N. 1969. A systematic review of the scorpionfishes of the Atlantic Ocean (Pisces: Scorpaenidae). Occ. Pap. Calif. Acad. Sci. 79, 130 p.
- Fahay, M.P. 1975. An annotated list of larvae and juvenile fishes captured with surface-towed meter net in the south Atlantic Bight during four R/V *Dolphin* cruises between May 1968 and February 1968. NOAA Tech. Rept. NMFS SSRF-685, 39 p.
- _____ and C.L. Obenchain. 1978. Leptocephali of the ophichthid genera *Ahlia*, *Myrophis*, *Ophichthus*, *Pisodonophis*, *Callechelys*, *Letharchus*, and *Aptherichtus* on the Atlantic continental shelf of the United States. Bull. Mar. Sci. 28(4):442-486.
- Firth, F.E. 1933. *Anthias nicholsi*, a new fish taken off Virginia in the deep-water trawl fishery. Copeia 1933(4): 158-160.
- Fowler, H.W. 1906. Some cold-blooded vertebrates of the Florida Keys. Proc. Acad. Nat. Sci. Phila. 58: 77-113.
- _____. 1937. Notes on fishes from the Gulf Stream and the New Jersey coast. Proc. Acad. Nat. Sci. Phila. 89:297-308.
- _____. 1952. A list of the fishes of New Jersey, with offshore species. Proc. Acad. Nat. Sci. Phila. 104:89-151.
- Frizsche, R.A. 1976. A review of the cornetfishes, genus *Fistularia* (Fistulariidae), with a discussion of intrageneric relationships and zoogeography. Bull. Mar. Sci. 26(2):196-204.
- _____. 1978. The first eastern Pacific records of bulleye, *Cookeolus boops* (Bloch and Schneider, 1801), (Pisces, Priacanthidae). Calif. Fish Game 64(3):219-221.
- Futch, C.R. and S.E. Dwinell. 1977. Near-shore marine ecology at Hutchinson Island, Florida: 1971-1974. IV. Lancelets and fishes Fla. Dept. Nat. Res., Mar. Res. Lab. Publ. 24, 23 p.
- Ginsburg, I. 1953. Western Atlantic scorpionfishes. Smithsonian Misc. Collec. 121(8):1-103.
- Hastings, R.W. 1977. Notes on the occurrence of the silver anchovy, *Engraulis eurystole*, in the northern Gulf of Mexico. Northeast Gulf. Sci. 1(2):116-118.
- Hiatt, R.W. and D.W. Strasburg. 1960. Ecological relationships of the fish fauna on coral reefs of the Marshall Islands. Ecol. Monogr. 30:65-127.
- Hildebrand, S.F. 1963. Family Engraulidae. Pp. 152-249. In: Y.H. Olsen (ed.), Fishes of the Western North Atlantic, Mem. Sears Found. Mar. Res. 1, Pt. 3.
- Hobson, E.S. 1974. Feeding relationships of teleostean fishes on coral

- reefs in Kona, Hawaii. *Natl. Mar. Fish. Serv., Fish. Bull.* 72(4):915-1031.
- Hoese, H.D. and R.H. Moore. 1977. *Fishes of the Gulf of Mexico, Texas, Louisiana, and Adjacent Waters*. Texas A&M University Press, College Station, 327 p.
- Jordan, D.S. and B.W. Evermann. 1896. *The Fishes of North and Middle America*. Bull. U.S. Nat. Mus. 47, Pts. 1-4, 3313 p.
- Liem, A.H. and W.B. Scott. 1960. *Fishes of the Atlantic Coast of Canada*. Fish. Res. Bd. Can., Bull. 155, 485 p.
- MacKay, K.T. and J. Gilhen. 1973. *Hirundichthys rondeleti*, *Cookeolus boops*, *Priacanthus arenatus*, *Sertola dumerilli*, four species new to the Canadian Atlantic ichthyofauna. *J. Fish. Res. Bd. Can.* 30(12), Pt. 1: 1911-1913.
- Mathews, F.D., M.M. Damkaer, L.W. Knapp and B.B. Collette. 1977. Food of western North Atlantic tunas (*Thunnus*) and lancetfishes (*Alepisaurus*). NOAA Tech. Rept. NMFS SSRF-706, 19 p.
- McCosker, J.E. 1977. The osteology, classification and relationships of the eel family Ophichthidae. *Proc. Calif. Acad. Sci.* 4th Ser., 41(1):1-123.
- McEachran, J.D. and W.N. Echemeyer. 1973. Range extensions for the scorpionfish *Scorpaena isthmensis*. *Fla. Sci.* 36(2-4):209-211.
- Musick, J.A. 1972. Fishes of Chesapeake Bay and the adjacent coastal plain, pp. 175-212. In: M.A. Wass (ed.), *A checklist of the biota of lower Chesapeake Bay, Virginia, Va.* Inst. Mar. Sci. Spec. Sci. Rep. 65.
- Nichols, J.T. and C.M. Breder. 1927. The marine fishes of New York and southern New England. *Zoologica* 9(1): 1-192.
- _____ and F.E. Firth. 1936. A new triacanthid fish and other species from deep water off Virginia. *Amer. Mus. Novitates* 883, 5 p.
- Norcross, J.J., W.H. Massman and E.B. Joseph. 1961. Investigations of inner continental waters off lower Chesapeake Bay. Part II. Sand lance larvae, *Ammodytes americanus*. *Chesapeake Sci.* 21(1-2): 49-59.
- Radcliffe, L. 1914. The work of the U.S. Fisheries marine biological station at Beaufort, N.C., during 1913. *Science* 40(1029): 413-417.
- Randall, J.E. 1964. A revision of the file-fish genera *Amaneses* and *Cantherhines*. *Copeia* 1964(2): 331-361.
- _____ .1967a. Food habits of reef fishes of the West Indies. *Stud. Trop. Oceanogr.* 5:665-847.
- _____ .1967b. *Ioglossus helenae*, a new gobiid fish from the West Indies. *Ichthyologica* 39(3-4): 107-116.
- Robins, C.R. and W.R. Starck. 1961. Materials for a revision of *Serranus* and related fish genera. *Proc. Acad. Nat. Sci. Phila.* 113(11): 259-314.
- Ross, S.W. and D.E. Fast. 1977. New records of tropical fishes collected on reefs in Onslow Bay, North Carolina. *ASB Bull.* 24(2): 82.
- Schroeder, W.C. 1955. Report on the results of exploratory otter-trawling along the continental shelf and slope between Nova Scotia and Virginia during the summers of 1952 and 1953. *Pap. Mar. Biol. and Oceanogr., Deep-Sea Res., Suppl. to Vol. 3*, pp. 358-372.
- Schwartz, F.J. and H.J. Porter. 1977. Fishes, macroinvertebrates, and their ecological interrelationships with a calico scallop bed off North Carolina. *Natl. Mar. Fish. Serv., Fish. Bull.* 75(2): 427-446.
- Smith, G.B., H.M. Austin, S.A. Bortone, R.W. Hastings, and L.H. Ogren. 1975. Fishes of the Florida Middle grounds with comments on ecology and zoogeography. *Fla. Dept. Nat. Res., Mar. Res. Lab. Publ.* 9, 14 p.

- Springer, S. 1966. A review of western Atlantic catsharks, Scyliorhinidae, with descriptions of a new genus and five new species. U.S. Fish Wildl. Serv., Fish. Bull. 65(3): 581-624.
- _____. 1979. A revision of the catsharks, Family Scyliorhinidae. NOAA Tech. Rept. NMFS Circ. 422, 152 p.
- _____. and V. Sadowsky. 1970. Subspecies of the western Atlantic catshark, *Scyliorhinus retifer*. Proc. Biol. Soc. Wash. 83(7): 83-89.
- Struhsaker, P. 1969. Demersal fish resources: Composition, distribution, and commercial potential of the continental shelf stocks off southeastern United States. Fishery Indus. Res. 4(7):261-300.
- Whitehead, P.J.P. 1973. The clupeoid fishes of the Guianas. Bull. Brit. Mus. Nat. Hist. (Zool.) Suppl. 5, 277 p.
- Wilk, S.J. and M.J. Silverman. 1976. Fish and hydrographic collections made by the research vessels *Dolphin* and *Delaware II* during 1968-72 from New York to Florida. NOAA Tech. Rept. NMFS SSRF-697, 159 p.
- Woods, L.P. and P.M. Sonoda. 1973. Order Berycomorphi (Beryciformes). Pp. 263-396. In: D.M. Cohen (ed.), Fishes of the Western North Atlantic, Mem. Sears Found. Mar. Res. 1, Pt. 6.