



NOAA Technical Report NMFS Circular 418

**Annotated Bibliography of
Four Atlantic Scombrids:
Scomberomorus brasiliensis,
S. cavalla, *S. maculatus*,
and *S. regalis***

Charles S. Manooch III, Eugene L. Nakamura,
and Ann Bowman Hall

December 1978

U.S. DEPARTMENT OF COMMERCE
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372. Fishery publications, calendar year 1971: Lists and indexes. By Thomas A. Manar. October 1972, iv + 24 p., 1 fig. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
374. Marine flora and fauna of the northeastern United States. Annelida: Oligochaeta. By David G. Cook and Ralph O. Brinkhurst. May 1973, iii + 23 p., 82 figs. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
375. New Polychaeta from Beaufort, with a key to all species recorded from North Carolina. By John H. Day. July 1973, xiii + 140 p., 18 figs., 1 table. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
376. Bottom-water temperatures on the continental shelf, Nova Scotia to New Jersey. By John B. Colton, Jr. and Ruth R. Stoddard. June 1973, iii + 55 p., 15 figs., 12 app. tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
377. Fishery publications, calendar year 1970: Lists and indexes. By Mary Ellen Engett and Lee C. Thorson. December 1972, iv + 34 p., 1 fig. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
378. Marine flora and fauna of the northeastern United States. Protozoa: Ciliophora. By Arthur C. Borror. September 1973, iii + 62 p., 1 fig., 109 figs. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
379. Fishery publications, calendar year 1969: Lists and indexes. By Lee C. Thorson and Mary Ellen Engett. April 1973, iv + 31 p., 1 fig. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
380. Fishery publications, calendar year 1968: Lists and indexes. By Mary Ellen Engett and Lee C. Thorson. May 1973, iv + 24 p., 1 fig. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
381. Fishery publications, calendar year 1967: Lists and indexes. By Lee C. Thorson and Mary Ellen Engett. July 1973, iv + 22 p., 1 fig. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
382. Fishery publications, calendar year 1966: Lists and indexes. By Mary Ellen Engett and Lee C. Thorson. July 1973, iv + 19 p., 1 fig. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
383. Fishery publications, calendar year 1965: Lists and indexes. By Lee C. Thorson and Mary Ellen Engett. July 1973, iv + 12 p., 1 fig. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
384. Marine flora and fauna of the northeastern United States. Higher plants of the marine fringe. By Edwin T. Moul. September 1973, iii + 109 p., 109 figs. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
385. Fishery publications, calendar year 1972: Lists and indexes. By Lee C. Thorson and Mary Ellen Engett. November 1973, iv + 23 p., 1 fig. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
386. Marine flora and fauna of the northeastern United States. Pteronogonida. By Lawrence R. McCloskey. September 1973, iii + 12 p., 1 fig. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
387. Marine flora and fauna of the northeastern United States. Crustacea: Stomatopoda. By Raymond B. Manning. February 1974, ii + 6 p., 10 figs. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.



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U.S. DEPARTMENT OF COMMERCE

Juanita M. Kreps, Secretary

National Oceanic and Atmospheric Administration

Richard A. Frank, Administrator

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National Marine Fisheries Service

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Annotated Bibliography of Four Atlantic Scombrids: *Scomberomorus brasiliensis*, *S. cavalla*, *S. maculatus*, and *S. regalis*

Charles S. Manooch III,¹ Eugene L. Nakamura,² and Ann Bowman Hall¹

ABSTRACT

Annotated references are presented on 570 papers published from 1793 to 1977 on *Scomberomorus brasiliensis*, serra Spanish mackerel; *S. cavalla*, king mackerel; *S. maculatus*, Spanish mackerel; and *S. regalis*, cero. A subject index is included for each species and covers a variety of topics ranging from taxonomy to commercial and recreational fishing.

INTRODUCTION

Atlantic mackerels of the genus *Scomberomorus* are important to commercial fisheries off North America, South America, and Africa. Also, recreational anglers off the Gulf and southeastern coasts of the United States catch large quantities of king mackerel, *Scomberomorus cavalla* (= *S. caballa*, *Cybium caballa*, *C. cavalla*); Spanish mackerel, *S. maculatus* (= *Scomber maculatus*, *C. maculatum*); and to a lesser extent, cero, *S. regalis* (= *Scomber regalis*, *C. regalis*). Spanish mackerel found off Central and South America previously identified as *S. maculatus* have been reclassified as *S. brasiliensis* (Collette, Russo, and Zavala-Camin 1978). Considering the importance of this group of pelagic fish, several United States Regional Fishery Management Councils are evaluating the present state of knowledge on mackerels to assist in the development of management plans.

This bibliography provides scientific and industrial investigators with an up-to-date and comprehensive list of references to the literature on western Atlantic

mackerels. It is our intent that the bibliography will not only aid others in fulfilling current research objectives, but will initiate studies in areas we deem deficient at this time.

Several points are evident to us after compiling this listing. South American scientists, particularly those from Brazil, are far advanced of their North American neighbors in specific areas of research such as anatomy and physiology, life histories, population dynamics, and documentation of annual catch and effort statistics. The relatively large number of papers by U.S. scientists is misleading. Most articles referred to herein merely mention mackerels incidental to other species. There are deficiencies or gaps of knowledge in recreational catch and effort, migration patterns, and stock identity, and large scale life history studies all of which are essential in formulating plans for this important fishery resource.

We are grateful for the assistance received from many libraries throughout the country in obtaining publications and especially to Bruce B. Collette, National Systematics Laboratory, NMFS, Washington, D.C., for allowing us to review his personal bibliography on Scombridae and for information relative to the taxonomic status of *S. maculatus*. Collette believes all references to *S. maculatus* from the eastern Atlantic should be *S. tritor* and should be *S. brasiliensis* from Central and South American waters. The difficult task of typing the manuscript was accomplished by Valerie N. Guida and Jean Willis and is sincerely appreciated.

¹Contribution Number 77-01B. Southeast Fisheries Center, National Marine Fisheries Service, NOAA, Beaufort Laboratory, Beaufort, NC 28516.

²Southeast Fisheries Center, National Marine Fisheries Service, NOAA, Panama City Laboratory, Panama City, FL 32401.

BIBLIOGRAPHY

Adams, A.C., and W.C. Kendall. 1891. Report upon an investigation of the fishing grounds off the west coast of Florida. Bulletin of the U.S. Fish Commission for 1889, vol. 9, p. 289-312.

S. regalis is listed in the catch.

Albuquerque, J.J.L., and R.C.F. Bezerra. 1968. Sampling of king mackerel and Spanish mackerel in Ceará. Revista Brasileira de Biologia, vol. 28, no. 2, p. 141-145.

The minimum monthly sampling of king mackerel, S. cavalla, and Spanish mackerel, S. maculatus (= S. brasiliensis), was determined in the State of Ceará, Brazil.

Alcantara, P., Filho. 1972a. Auscência da nadadeira anal em Scomberomorus maculatus [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 12, no. 2, p. 157.

An S. maculatus (= S. brasiliensis) with no anal fin was caught off Ceará, Brazil, on October 10, 1972.

Alcantara, P., Filho. 1972b. Sobre a captura da serra, Scomberomorus maculatus (Mitchill), com redes-de-espera, no Estado do Ceará [in Portuguese, English summary]. Arquivos de Ciências do Mar. vol. 12, no. 1, p. 77-84.

Gear and methods of fishing for Spanish mackerel, S. maculatus (= S. brasiliensis), are described and a general analysis of 2,428 controlled fisheries from 1968 to 1971 was made. Some aspects on the selective action of the nets and a comparative study of the age distribution of fish caught by gill nets and trolling lines led to a recommendation that the mesh size of gill nets used in the State of Ceará ought to be enlarged.

Alcantara, P., Filho. 1972c. Sobre a capture da cavala, *Scomberomorus cavalla* (Cuvier), com redes-de-espera, no Estado do Ceará, [in Portuguese with English summary]. Arquivos de Ciências do Mar, vol. 12, no. 2, p. 133-138.

Commercial gill net and trolling fishery is described. The catch per unit effort, age distribution of the catch, and sexual maturity for king mackerel are included.

Alexander, A.B. 1905a. Statistics of the fisheries of the Gulf States, 1902. U.S. Commissioner of Fish and Fisheries, Report for 1903, vol. 29, p. 411-418.

Commercial data for king mackerel and Spanish mackerel are included.

Alexander, A.B. 1905b. Statistics of the fisheries of the New England States, 1902. U.S. Bureau of Fisheries, Report for 1904, p. 245-325.

Data on king mackerel and Spanish mackerel are included.

Alexander, A.B. 1905c. Statistics of the fisheries of the South Atlantic States, 1902. U.S. Commissioner of Fish and Fisheries, Report for 1903, vol. 29, p. 343-410.

Commercial catch data for cero, king mackerel, and Spanish mackerel are included.

Allyn, R. 1969. Florida fishes. Great Outdoors Publishing Company, St. Petersburg, Fla. 90 p.

Brief comments are made on the description and recreational fishing for S. maculatus and S. cavalla.

Almeida, H.T. 1974. Sobre a produção pesqueira de alguns currais-de-pesca do Ceará - dados de 1971 a 1973 [in Portuguese, English summary]. Boletim de Ciências do Marinha, no. 26, p. 1-9.

Wooden fish-weirs are very common along the coast of the State of Ceará (Brazil), being more concentrated at Acaraú County beaches. This work specifies the yields of the weirs at Almofala (Acaraú - Ceará - Brazil), during 1971 to 1973, with special attention to the indexes of daily capture during the year. Spanish mackerel, S. maculatus (= S. brasiliensis), was included in the catch.

Alves, M.I.M. 1969. Sobre o trato digestivo da serra, Scomberomorus maculatus (Mitchill) [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 9, no. 2, p. 167-171.

The anatomy and histology of the digestive tube of S. maculatus (= S. brasiliensis) were studied. Seven specimens were used for dissections and anatomical study, and 9 were fixed in Bouin's solution and 10% Formalin for histological study. The esophagus, stomach, intestine, pyloric ceca, liver, and gall bladder were described in detail. Comparisons with the digestive tube of S. cavalla were made.

Alves, M.I.M., and G.S. Tomé. 1966. Anatomia e histologia do tubo digestivo de Scomberomorus cavalla (Cuvier, 1829) [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 6, no. 2, p. 103-108.

A study was made of the anatomy and histology of the digestive tube of 14 specimens of S. cavalla. Six fishes, both fresh and preserved in 10% Formalin, were used for histological study. The general histology of the different divisions of the tube, their tunics and tissues together with details of cell structure and arrangement are treated. The esophagus, stomach, intestine, and pyloric ceca are discussed in detail.

Alves, M.I.M., and G.S. Tomé. 1967a. Alguns aspectos do desenvolvimento maturativo das gônadas da cavala, Scomberomorus cavalla (Cuvier, 1829) [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 7, no. 1, p. 1-9.

An observation of the histological characteristics of the gonads of S. cavalla was reported for the first time. According to the histological aspects and average number of germinal cells by microscopical field the ovaries are characterized by 5 stages. The testes do not present structural variation to account for a classification as stages.

Alves, M.I.M., and G.S. Tomé. 1967b. Notas sobre os anexos digestivos da cavala, Scomberomorus cavalla (Cuvier, 1829) [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 7, no. 2, p. 173-175.

A study was made on the anatomy and histology of the liver and gall bladder of S. cavalla. The material consisted of 8 specimens captured in the coastal waters of the State of Ceará, Brazil. The general description of the lobes of liver, gall bladder, membranes, and tissues present, the arrangement of the hepatic laminae and the ducts and blood vessels are treated. Particular consideration is given to the hepatic cells.

Alves, M.I.M., and G.S. Tomé. 1968a. Algumas observações sobre o sêmen da serra, Scomberomorus maculatus (Mitchill) [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 8, no. 2, p. 139-140.

A description of spermatozoa and an estimate of the number per mm^3 for S. maculatus (= S. brasiliensis) is presented.

Alves, M.I.M., and G.S. Tomé. 1968b. Considerações sobre o sêmen da cavala, Scomberomorus cavalla (Cuvier) [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 8, no. 1, p. 31-32.

Characteristics of semen are given and the sperm of S. cavalla is described.

Alves, M.I.M., and G.S. Tomé. 1968c. Observações sobre o desenvolvimento maturativo das gônadas da serra, Scomberomorus maculatus (Mitchill, 1815) [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 8, no. 1, p. 25-30.

Sexual maturation of the Spanish mackerel, S. maculatus (= S. brasiliensis), is described. The testes do not present variation in structures in such a way to account for a classification as stages. The ovaries are characterized by five stages.

Alves, M.I.M., and G.S. Tomé. 1970. On the pyloric caeca in fishes of the genus Scomberomorus Lacépède. Arquivos de Ciências do Mar, vol. 10, no. 2, p. 181-184.

The macro and micro morphologies of the pyloric caeca of S. cavalla and S. maculatus (= S. brasiliensis) are described. Enzyme tests were made and maltase, lipase, and trypsin were found in caeca and intestine of both species. Pepsin was found only in the stomach of S. cavalla, but in both stomach and caeca of Spanish mackerel.

Anderson, W.W., Jr., J.K. Dias, R.K. Dias, D.M. Cupka, and N.A. Chamberlain. 1977. The macrofauna of the surf zone off Folly Beach, South Carolina. U.S. National Marine Fisheries Service, Special Scientific Report-- Fisheries, no. 704, 23 p.

One juvenile (106 mm) S. maculatus is included in a list of fishes collected. It was collected in July when the water was 27.4°C and the salinity was 33.4 o/oo.

Anderson, W.W. 1968. Fishes taken during shrimp trawling along the south Atlantic coast of the United States, 1931-37. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 570, 60 p.

S. cavalla were caught by trolling and the stomach contents noted.

Anderson, W.W., and J.W. Gehringer. 1957a. Physical oceanographic, biological, and chemical data, south Atlantic coast of the United States, M/V Theodore N. Gill cruise 3. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 210, 208 p.

S. cavalla were caught by trolling and the stomach contents noted.

Anderson, W.W., and J.W. Gehringer. 1957b. Physical oceanographic, biological, and chemical data, south Atlantic coast of the United States, M/V Theodore N. Gill cruise 4. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 234, 192 p.

S. cavalla and S. maculatus were caught by trolling and the stomach contents were noted.

Anderson, W.W., and J.W. Gehringer. 1959a. Physical oceanographic, biological and chemical data, south Atlantic coast of the United States, M/V Theodore N. Gill cruise 7. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 278, 277 p.

S. cavalla and S. maculatus were caught by trolling and the stomach contents were noted.

Anderson, W.W., and J.W. Gehringer. 1959b. Physical oceanographic, biological, and chemical data, south Atlantic coast of the United States, M/V Theodore N. Gill cruise 8. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 303, 227 p.

S. cavalla and S. regalis were caught by trolling and the stomach contents were noted.

Anderson, W.W., and J.W. Gehringer. 1959c. Physical oceanographic biological, and chemical data, south Atlantic coast of the United States, M/V Theodore N. Gill cruise 9. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 313, 226 p.

S. cavalla was caught by trolling and the stomach was empty.

Anderson, W.W., and J.W. Gehringer. 1965. Biological-statistical census of the species entering fisheries in the Cape Canaveral area. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 514, 79 p.

S. maculatus and S. cavalla are discussed as commercial fisheries. The recreational catch statistics are presented.

Anonymous. 1907. Statistics of the fisheries of the Middle Atlantic States for 1904. U.S. Bureau of Fisheries, Report for 1905, 122 p.

Commercial fishery data on the kingfish and Spanish mackerel are presented.

Anonymous. 1969. Gallery of marine fishes (game species), p. 107-133. In Wondrous world of fishes. New enlarged ed. National Geographic Society, Washington, D.C.

Notes on the distribution and general description of S. maculatus and S. regalis are presented.

Anonymous. 1971. Food fish facts: Spanish mackerel. Commercial Fisheries Review, vol. 33, no. 10, p. 46-47.

This brief article on Spanish mackerel, S. maculatus, describes color, habitat, fishing, management and conservation, and the fishery products.

Arcisz, W. 1950. Ciguatera: Tropical fish poisoning. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 27, 23 p.

Ciguatera was reported for both S. regalis and S. cavalla.

Arnold, E.L., Jr. 1951. Northward dispersal of warm-water marine fishes in southern New England during the summer of 1949. Copeia, 1951, no. 1, p. 87-88.

Record high temperatures prevailed throughout the eastern seaboard states during the summer of 1949 and are considered a major factor in the unusual appearance of fishes whose normal range is farther to the south. The Spanish mackerel is included in the list of fishes.

Atwater, W.O. 1885. Contributions to the knowledge of the chemical composition and nutritive values of American foodfishes and invertebrates. U.S. Commissioner of Fish and Fisheries, Report for 1883, part 11, p. 433-499.

Protein, fats, carbohydrates, ash, water, and salt contents of Spanish mackerel, Cybium maculatum, are given.

Atwater, W.O. 1892. The chemical composition and nutritive values of food fishes and aquatic invertebrates. U.S. Commissioner of Fish and Fisheries, Report for 1888, part 16, p. 679-868.

S. maculatus is included in analyses of nutritive values.

Bailey, R.M., 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. 3rd ed. American Fisheries Society, Special Publication, no. 6, 150 p.

S. cavalla, S. maculatus, and S. regalis from the Atlantic, and S. concolor and S. sierra from the Pacific are listed.

Baird, S.F. 1889. The sea fisheries of eastern North America. U.S. Commissioner of Fish and Fisheries, Report for 1886, part 14, p. 3-244.

Distribution, commercial landings and movements are presented for S. maculatus and S. regalis.

Bane, G.W., Jr. 1965. Exploratory fishing for tuna in the Mona Passage. Proceedings of the Gulf and Caribbean Fisheries Institute, 17th Annual Session, 1964, p. 56-61.

Young S. regalis and S. cavalla were caught in nets incidental to fishing for bait.

Bashirullah, A.K.M. 1973. Arrastres exploratorios en la plataforma continental de la Guayana. II. Especies de peces capturados y su abundancia relativa [in Spanish, English abstract]. Laguna, vol. 32, p. 13-26.

One S. maculatus (= S. brasiliensis) was caught in a trawl at 22 fathoms.

Bastos, J.R. 1965a. Attraction action of various organic substances to the ant Pheidole radoszkowskii Mayr. Boletim Sociedade Cearense Argonomia, no. 6, p. 75-78.

The following materials were used: cane sugar, dry milk, cornstarch, crude beef, crude fish, S. maculatus (Mitchill) (= S. brasiliensis), parts of bodies of Periplaneta americana L., and beer ferment, Saccharomyces cerevisiae Meyen. The ant P. radoszkowskii preferred body parts of P. americana.

Bastos, J.R. 1965b. Um caso anômalo em Scomberomorus maculatus (Mitchill) [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 5, no. 2, p. 215.

A Spanish mackerel (= S. brasiliensis) with two anal openings was found. The specimen was caught at Mucuripe Beach (Fortaleza - Ceará - Brazil) by a beach seine, on June 2nd, 1965.

Bastos, J.R. 1966a. Sobre a biometria da serra, Scomberomorus maculatus (Mitchill), da costa do Estado do Ceará [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 6, no. 2, p. 113-117.

Various morphometric ratios, linear regressions, conditions, and meristics are presented for Spanish mackerel (= S. brasiliensis) collected off Brazil.

Bastos, J.R. 1966b. Sobre a série vermelha do sangue de Scomberomorus maculatus (Mitchill) [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 6, no. 1, p. 39-45.

Erythrocytes of Spanish mackerel (= S. brasiliensis) from coastal waters of the State of Ceará, Brazil, were studied. The fork length of the individuals analyzed ranged from 18.6 to 65.0 cm. Hemoglobin concentration varied from 7.0 to 14.0 g/100 ml. Significant variations were found among fork length classes. The number of erythrocytes per mm³ of blood varied from 2.90 to 4.41 millions. Significant variations were found among fork length classes. Volume of packed erythrocytes (hematocrit) varied from 32 to 60%. Significant variations were found among fork length classes. Mean corpuscular volume varied from 84.2 to 184.3 cubic microns. Significant variations were not found among fork length classes. Mean corpuscular hemoglobin concentration varied from 15.0 to 27.4%.

Bastos, J.R., T.T. Alves, C.A.E. Araripe, and F.J.S. Telles. 1973. Sobre a elaboração de conservas de pescado em leite do côco e em óleos de algodão e de babacu [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 13, no. 1, p. 25-29.

The bacteriological, organoleptical, and chemical aspects of canned products of *S. cavalla*, *S. maculatus* (= *S. brasiliensis*) and of the tarpon, *Tarpon atlanticus*, in coconut milk and cottonseed and babassu oils were examined monthly during a 6-month period. The bacteriological analyses were made on random samples which had previously been incubated at 37°C for 15 days. The finished products were characterized according to odor, flavor, and texture. Humidity, protein, fat, ash, acidity, and pH were determined on the meat, acidity and pH on the coconut milk, and acidity on the cotton and babassu oils.

Bauchot, M.L., and M. Blanc. 1961. Catalogue des types de Scombroidei (Poissons Téléostéens Perciformes) des collections du Muséum National d'Histoire Naturelle de Paris. Bulletin du Muséum National d'Histoire Naturelle, Paris, 2^e série, vol. 33, no. 4, p. 369-379.

Specimen type, number of each species, preservations, total length and standard length, collection number, and synonyms are given for Spanish mackerel, king mackerel, and cero.

Bauer, B.A., and R.R. Eitenmiller. 1974. Muscle arylamidase activity of several marine species. Journal of the Fisheries Research Board of Canada, vol. 31, no. 4, p. 445-449.

Arylamidase activity in muscle extracts of Spanish mackerel, mullet, whiting, blue crab, quahog clam, and shrimp was investigated. The optimum pH for activity was between 7.0 and 7.5 for each species using alanyl- β -naphthylamide as substrate. Enzymes of the 3 species of fish exhibited maximum activity against alanyl- β -naphthylamide.

Baughman, J.L. 1941. Scombriformes, new, rare, or little known in Texas waters with notes on their natural history or distribution. Transactions of the Texas Academy of Science, vol. 24, p. 14-26.

Three members of the family Cybiidae are discussed. Notes on the distribution, seasonal occurrence, reproduction, habitat, and recreational fishery are given for S. cavalla, distribution and seasonal occurrence for S. maculatus, and the distribution of S. regalis.

Baughman, J.L. 1947. Fishes not previously reported from Texas, with miscellaneous notes on other species. Copeia, 1947, no. 4, p. 280.

On September 13, 1946, 10 small Spanish mackerel, S. maculatus, were obtained with a minnow seine off Mustang Island. Total lengths ranged from 32 to 42 mm and provided the first evidence that the species breeds off the Texas coast.

Baughman, J.L. 1949. The future of Texas fisheries. Proceedings of the Gulf and Caribbean Fisheries Institute, Inaugural Session, p. 15-19.

This article discusses S. cavalla and S. maculatus as potential fisheries for Gulf of Mexico fishermen.

Baughman, J.L. 1950a. Potentials of the Gulf of Mexico fisheries and recommendations for their realization. Proceedings of the Gulf and Caribbean Fisheries Institute, 2nd Annual Session, 1949, p. 118-126.

The fisheries of the Gulf of Mexico present many potentialities for development. The Spanish mackerel and king mackerel are among the littoral species holding the most promise. The poundage landed and monetary values are presented for the two species.

Baughman, J.L. 1950b. Random notes on Texas fishes. Part II. Texas Journal of Science, vol. 2, no. 2, p. 242-263.

Distribution, spawning and size of S. cavalla, S. regalis, and S. maculatus are included.

Bean, B.A. 1892. Fishes collected by William P. Seal in Chesapeake Bay, at Cape Charles City, Virginia, September 16 to October 3, 1890. Proceedings of the U.S. National Museum, vol. 14, p. 83-94.

Spanish mackerel, S. maculatus, were harvested by commercial fishermen using pound nets. Retail price of the fish measuring 12 to 24 inches was 30 cents per pound.

Bean, T.H. 1880. Check-list of duplications of North American fishes distributed by the Smithsonian Institution in behalf of the United States National Museum, 1877-1880. Proceedings of the U.S. National Museum, vol. 3, p. 75-116.

One Spanish mackerel, Cybium maculatum, is included.

Bean, T.H. 1888. Report on the fishes observed in Great Egg Harbor Bay, New Jersey, during the summer of 1887. Bulletin of the U.S. Fish Commission for 1887, vol. 7, p. 129-154.

The list of fishes includes a 11.75 inch S. maculatus caught by purse seine off Somers Point, N.J. The article also refers to specimens collected by Spencer F. Baird in 1854 at Beesley's Point, N.J.

Bean, T.H. 1903. Catalogue of the fishes of New York. New York State Museum Bulletin 60, Zoology 9. 787 p.

The genus Scomberomorus is described on p. 395-401. Color characteristics, meristics, morphometrics, geographical ranges, and fisheries are presented for S. maculatus, S. regalis, and S. cavalla. Reference is made to Spanish mackerel spawning off the Long Island coast in August, and the size of the eggs.

Beard, H.R. 1926. Nutritive value of fish and shellfish. U.S. Commissioner of Fisheries, Report for 1925, Appendix 10, p. 501-552.

Kingfish and Spanish mackerel are included in nutritive value analyses.

Bearden, C.M. 1961a. Common marine fishes of South Carolina. Bears Bluff Laboratory, Contribution, no. 34. 47 p.

The distribution, size, color, and general notes on S. maculatus and S. cavalla are presented.

Bearden, C.M. 1961b. List of marine fishes recorded from South Carolina. Bears Bluff Laboratories, Wadmalaw Island, S.C. 12 p.

The list includes S. cavalla, S. maculatus, and S. regalis.

Beardsley, G.L., Jr., N.R. Merrett, and W.J. Richards. 1975. Synopsis of the biology of the sailfish, Istiophorus platypterus (Shaw and Nodder, 1791), p. 95-120. In R.S. Shomura and F. Williams (ed.), Proceedings of the International Billfish Symposium, Kailua-Kona, Hawaii, 9-12 August 1972. Part 3. Species Synopses. U.S. National Marine Fisheries Service, Special Scientific Report--Fisheries, no. 675.

This work cites Voss (1953), who found S. regalis in the stomach of a sailfish.

Beardsley, G.L., Jr., and W.J. Richards. 1970. Size, age, seasonal abundance, and length-weight relation of some scombrid fishes from southeast Florida. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 595, 6 p.

seven species of scombrid fishes, including S. cavalla, S. maculatus, and S. regalis, were sampled for length and weight at a taxidermy firm for 1 year (Sept. 1967-Sept. 1968). These data yielded information on size and seasonal abundance of the species off Florida.

Beaumariage, D.S. 1969. Returns from the 1965 Schlitz tagging program including a cumulative analysis of previous results. Florida Department of Natural Resources, Marine Laboratory, Technical Series, 59, 38 p.

S. cavalla, S. maculatus, and S. regalis were tagged and released. Only S. cavalla was recovered.

Beaumariage, D.S. 1970. Current status of biological investigations of Florida's mackerel fisheries. Proceedings of the Gulf and Caribbean Fisheries Institute, 22nd Annual Meeting, 1969, p. 79-86.

The commercial and recreational fishery catch statistics are given for Spanish and king mackerel. Length frequencies, sex ratios, weights, otoliths, gonads, larvae, and juveniles are discussed.

Beaumariage, D.S. 1973. Age, growth and reproduction of king mackerel, Scomberomorus cavalla, in Florida. Florida Marine Research Publication, no. 1, 45 p.

King mackerel were sampled during 1968-69 from commercial and recreational dockside landings. This study includes synonymy, description, distribution, notes on the commercial and recreational fisheries, age determination, growth equations, adult survival (mortality) rates, foods, reproduction, and management considerations.

Beaumariage, D.S., and A.C. Wittich. 1966. Returns from the 1964 Schlitz tagging program. Florida Board of Conservation, Marine Laboratory, Technical Series, 47, 50 p.

S. cavalla and S. maculatus were tagged and released. None of the fish were recovered.

Becker, C.D. 1970. Haematazoa of fishes, with emphasis on North American records, p. 82-100. In Stanislas F. Snieszko (ed.), A symposium on diseases of fishes and shellfishes. American Fisheries Society, Special Publication, no. 5.

S. regalis and S. cavalla are hosts for parasites.

Becker, E.L., R. Bird, J.W. Kelly, J. Schilling, S. Solomon, and N. Young. 1958. Physiology of marine teleosts. II. Hematologic observations. Physiological Zoology, vol. 31, no. 3, p. 228-231.

This study is concerned with hematologic observations of marine teleosts, including S. maculatus, together with histologic observations of blood-forming organs. Data presented on the Spanish mackerel includes: alkali-resistant hemoglobin (A.R.H. as % of original), red blood cell count ($\times 10^6$), hematocrit (%), segmented neutrophils, differential white blood count (%), red cell fragility, and electrophoretic patterns of the serum.

Beebe, W., and G. Hollister. 1935. The fishes of Union Island, Grenadines, British West Indies, with the description of a new species of star-gazer. Zoologica, vol. 19, no. 6, p. 209-224.

A list of 118 species of fish is presented including the king mackerel and cero. The method of collection, size, and some meristic and morphometric data are given for each species.

Beebe, W., and J. Tee-Van. 1938. The fishes of Port-au-Prince Bay, Haiti, with a summary of the known species of marine fish of the island of Haiti and Santo Domingo. Zoologica, vol. 10, no. 1, p. 1-279.

This work refers to the Spanish mackerel and "king" or painted mackerel (S. regalis). A key, color characteristics, size, general range, local range, and foods are presented for S. regalis. A taxonomic key, color characteristics, size, general and local range, notes on the commercial fishery, foods, and parasites are included under Spanish mackerel, S. maculatus.

Beebe, W., and J. Tee-Van. 1970. Field book of the shore fishes of Bermuda and the West Indies. Dover Publications, New York. 337 p. (Republication of Beebe and Tee-Van, 1933, Field book of the shore fishes of Bermuda, G. P. Putman's Sons.)

The description and distribution of S. maculatus is presented.

Belloc, M. 1950. The fisheries of the Antilles. Proceedings of the Gulf and Caribbean Fisheries Institute, 2nd Annual Session, 1949, p. 110-113.

S. cavalla is listed as one of the edible fish of Martinique.

Bere, R. 1936. Parasitic copepods from Gulf of Mexico fish. American Midland Naturalist, vol. 17, no. 3, p. 577-675.

The parasite, Caligus bonito Wilson, was found in the branchial cavity of the king mackerel.

Berrien, P., and D. Finan. 1977. Biological and fisheries data on king mackerel, Scomberomorus cavalla (Cuvier). U.S. National Marine Fisheries Service, Sandy Hook Laboratory, Highlands, N.J., Technical Series Report, no. 8, 42 p.

This synopsis includes brief discussions and references to literature on subjects such as identity, life history aspects, and fishing.

Bigelow, H.B., and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 53, no. 74, p. 1-577.

Description, size, range, and occurrence of S. maculatus, S. regalis, and S. cavalla in the Gulf of Maine is presented.

Bigelow, H.B., and W.W. Welsh. 1925. Fishes of the Gulf of Maine. Bulletin of the U.S. Bureau of Fisheries, for 1924, vol. 15, part 1, p. 1-567.

The description, color, size, geographic range, occurrence in Gulf of Maine, and habits of S. maculatus and S. regalis are presented.

Bloch, M.E. 1793. Naturgeschichte der Ausländischen Fische, t. 3. Berlin, Germany.

This is the original description of Scomber regalis.

Bloch, M.E., and J.G. Schneider. 1801. Systema ichthyologiae. Sumtibus Auctoris Impressum et Bibliopolio Sanderiano Commisum, Berlin. 584 p.

A description of Scomber regalis is included in this work.

Bohlke, J.E., and C.G. Chaplin. 1968. Fishes of the Bahamas and adjacent tropical waters. Livingston Publishing Company, Wynnewood, Pa. 771 p.

The size, description, color, and distribution of the cero, S. regalis, is presented.

Bravo Hollis, M. 1953. Monogeneos de las branquias de los peces marinos de las costas de Mexico. Memoria del Congreso Cientifico Mexicano, vol. 7, p. 139-146.

The king mackerel is listed as a host for Pseudaxine mexicana and Scomberomorus sp. as host for Thoracocotyle paradoxica.

Bravo Hollis, M., and J.C. Deloya. 1973. Catálogo de la colección helmintológica del Instituto de Biología. Instituto de Biología, Universidad Nacional Autónoma de México, Publicaciones Especiales, no. 2, 138 p.

Trematodes are identified from S. cavalla, S. sierra, and S. sp.

Brawner, J.T., and C.B. Davis. 1974. The impact of export opportunities on southeastern fisheries. Proceedings of the Gulf and Caribbean Fisheries Institute, 26th Annual Session, 1973, p. 106-110.

A 1972 U.S.-Japan agreement allowed an increase in certain U.S. exports to Japan, including fisheries products. Spanish mackerel (S. maculatus), king mackerel (S. cavalla), eel (Anguilla rostrata), croaker (Micropogon undulatus), and all varieties of shrimp were included. The potential of this demand on these United States fisheries is described, and marketing information is given.

Breder, C.M., Jr. 1948. Field book of marine fishes of the Atlantic coast from Labrador to Texas. C.P. Putnam and Sons, New York. 332 p.

Keys, occurrence, notes, foods, and spawning are presented for S. cavalla, S. maculatus, and S. regalis.

Breuer, J.P. 1961-62. Population studies of the sports and commercial fin-fish and forage species of the lower Laguna Madre. Texas Parks and Wildlife Department, Coastal Fisheries Project Reports, p. 1-33.

Juvenile S. maculatus occurred in four minnow seine drags on Boca Chica Beach and Mansfield jetties (Texas).

Breuer, J.P. 1962. An ecological survey of the lower Laguna Madre of Texas, 1953-1959. University of Texas, Institute of Marine Science, Publications, vol. 8, p. 153-183.

S. maculatus and S. cavalla are listed among the fishes observed in the Laguna Madre, Texas.

Brice, J.J. 1898a. The fish and fisheries of the coastal waters of Florida. U.S. Commissioner of Fish and Fisheries, Report for 1896, part 22, p. 263-342.

S. cavalla and S. maculatus are included in the commercial fisheries. Landings are given for the two species.

Brice, J.J. 1898b. A manual of fish-culture, based on the methods of the United States Commission of Fish and Fisheries. U.S. Commissioner of Fish and Fisheries, Report for 1897, part 23, p. 1-340.

The description, distribution, size, fishery, spawning, and propagation information for S. maculatus is given. Mention is made of S. regalis and S. cavalla as other species of Scomberomorus on eastern coast of the United States.

Briggs, J.C. 1958. A list of Florida fishes and their distribution. Bulletin of the Florida State Museum of Biological Sciences, vol. 2, no. 8, p. 223-318.

S. maculatus, S. regalis, and S. cavalla are included.

Bright, T.J., and C.W. Cashman. 1974. Fishes, p. 339-409. In T.J. Bright and L.H. Pequegnat (ed.), Biota of the West Flower Garden Bank. Gulf Publishing Company, Houston, Tex.

The king mackerel is referred to as a pelagic fish rarely seen over reef or hard-bank. A brief description and distribution is provided.

Brown, R.J. 1971. Pathology of pompano with whirling disease and Spanish mackerel with enteric cestodiasis, p. 132-136. In J.W. Avault (ed.), Proceedings of the 1st Annual Workshop of the World Mariculture Society, 1971. Louisiana State University, Baton Rouge.

A Spanish mackerel, S. maculatus, caught in Pensacola Bay was examined internally for parasites. At necropsy, the only gross finding noted was intestinal parasitism, closely resembling tapeworms.

Bryan, C.E. 1971. An ecological survey of the Arroyo Colorado, Texas, 1966-1969. Texas Parks and Wildlife Department, Technical Series, no. 10, p. 1-28.

A 245-mm S. maculatus was taken by trawl in an ecological survey made in December 1968.

Buchanan, C.C. 1973. Effects of an artificial habitat on the marine sport fishery and economy of Murrells Inlet, South Carolina. Marine Fisheries Review, vol. 35, no. 9, p. 15-22.

S. maculatus, S. cavalla, and S. regalis are mentioned as three of the species caught by recreational anglers.

Buchanan, C.C. 1975. Comparative study of the sport fishery over artificial and natural habitats off Murrells Inlet, S.C., p. 34-38. In L. Colunga and R. Stone (ed.), Proceedings of the International Conference on Artificial Reefs, 1974, Houston, Tex. TAMU-SG-74-103.

S. maculatus dominated the surface catch from both of the habitats. S. cavalla were attracted to artificial reefs by the presence of baitfish.

Buchanan, C.C., R.B. Stone, and R.O. Parker, Jr. 1974. Effects of artificial reefs on a marine sport fishery off South Carolina. Marine Fisheries Review, vol. 36, no. 11, p. 32-38.

S. maculatus, S. cavalla, and other species were caught over an artificial reef off South Carolina.

Buen, F. 1972. Los peces teleostomos (Teleostomi), p. 55-332. In L. Cendrero (ed.), Zoología Hispanoamericana. Vertebrados. Editorial Parrva, México, D.F.

Local distributions are given for S. caballa, S. maculatus (= S. brasiliensis), and S. regalis.

Bullis, H.R., Jr., R.B. Roe, and J.C. Gatlin. 1972. The Southeast Fisheries Center bionumeric code. Part I. Fishes. U.S. National Marine Fisheries Service, Special Scientific Report--Fisheries, no. 659, 95 p.

The codes for S. cavalla, S. maculatus, and S. regalis are presented.

Bullis, H.R., Jr., and J.R. Thompson. 1965. Collections by the exploratory fishing vessels Oregon, Silver Bay, Combat, and Pelican made during 1956 to 1960 in the southwestern North Atlantic. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 510, 130 p.

S. cavalla, S. maculatus, and S. regalis are included by capture method and station data.

Burns, C. 1970. Fishes rarely caught in shrimp trawl. Gulf Research Reports, vol. 3, no. 1, p. 110-130.

Five specimens of S. maculatus were collected in Mississippi waters. The depths, salinity, temperature, and dates are given.

Butz, G., and R.J. Mansueti. 1962. First record of the king mackerel, Scomberomorus cavalla, in northern Chesapeake Bay, Maryland. Chesapeake Science, vol. 3, no. 2, p. 130-135.

Three king mackerel were taken in pound nets during October 1961 off Swan Point, Kent County. These were part of a school that apparently invaded the upper Bay during late summer and fall. Meristic and morphometric data from them were compared with specimens from other points along the range of the species; the differences were not great except for tooth counts. Data are given on the king mackerel fishery in southern Chesapeake Bay, Va., and records of the cero, S. regalis, are discussed.

Cadenat, J. 1937. Recherches systématiques sur les poissons littoraux de la Côte Occidental d'Afrique, récoltés par le navire Président Théodore-Tissier, au cours de sa 5^e croisière (1936). Revue des Travaux de l'Office Scientifique et Technique des Pêches Maritimes, t. 10, fasc. 4, no. 40, p. 423-562.

S. maculatus were collected at station 697 off Dakar. Synonyms are listed for the species.

Cadenat, J. 1950. Poissons de Mer du SÉNÉGAL. Institut Français d'Afrique Noire, Initiations et Etudes Africaines, no. 3, 435 p.

The Spanish mackerel of the eastern Atlantic is listed as a distinct species under the name Cybiium tritor (C. and V.).

Cain, R.L., and J.M. Dean. 1976. Annual occurrence, abundance and diversity of fish in a South Carolina intertidal creek. Marine Biology, vol. 36, no. 4, p. 369-379.

One S. maculatus was caught by seine on September 22, 1972 in South Clambank Causeway Creek. The weight of the fish was 2.3 g.

Caland, M.C., G.H.F. Viera, and R.P. Monteiro. 1968. Conservação em salmoura de pescado do gênero Scomberomorus Lacépède [in Portuguese, English summary]. Boletim da Estação de Biologia Marina da Universidade Federal do Ceará, no. 19, 10 p.

Experimental preservation of fishes of the genus Scomberomorus with acid and cellaline brines is discussed.

Caldwell, D.K. 1966. Marine and freshwater fishes of Jamaica. Bulletin of the Institute of Jamaica, Science Series, no. 17, 120 p.

S. cavalla and S. maculatus are included in a list of fishes. The later is probably misidentified.

Campillo Sainz, J. 1976. Catalogo de peces marinos Mexicanos. Secretaría de Industria y Comercio, Subsecretaría de Pesca, Instituto Nacional de Pesca, Mexico. 462 p.

A taxonomic key for genera in the family Scombridae and also the common names and distribution for S. maculatus is included in this work on the marine fishes of Mexico.

Carey, F.G., J.M. Teal, J.W. Kanwisher, K.D. Lawson, and J.S. Beckett. 1971. Warm-bodied fish. American Zoologist, vol. 11, p. 135-143.

Two groups of fishes, the tunas and the lamnid sharks, have evolved countercurrent heat-exchange mechanisms for conserving metabolic heat and raising their body temperatures. Experimental fishes include the cero, S. regalis.

Carlson, C.B. 1952. Exploratory fishing for the little tuna (Euthynnus alleteratus) off the Atlantic coast of the United States. Proceedings of the Gulf and Caribbean Fisheries Institute, 4th Annual Session, 1951, p. 89-94.

A Spanish mackerel, S. maculatus, was found in the stomach of a little tuna.

Carson, R.L. 1944. Fish and shellfish of the South Atlantic and Gulf coasts. U.S. Department of the Interior, Conservation Bulletin no. 37, 45 p.

Notes on the description, distribution, seasonal occurrence, foods, and reproduction are given for the Spanish mackerel and the commercial value, seasonal occurrence, and description for king mackerel. The cero is mentioned only to distinguish between the other two species.

Causey, D. 1953. Parasitic Copepoda of Texas coastal fishes. University of Texas, Institute of Marine Sciences, Publications, vol. 3, p. 7-16.

Both S. maculatus and S. cavalla are listed as hosts for parasitic copepods, Caligus pelamydis, C. repax, and Brachiella thynni on S. cavalla and C. productus and C. repax on S. maculatus.

Cervigon, F. 1966. Los peces marinos de Venezuela, vol. 2. Estacion de Investigaciones Marinas de Margarita, Fundacion la Salle de Ciencias Naturales, Caracas, Monografia no. 12, p. 449-951.

The color, distinguishing characters, size, food, method of capture, and distribution of S. cavalla, S. regalis, and S. maculatus (= S. brasiliensis) are discussed.

Chabanaud, P., and T. Monod. 1926. Les poissons de Port-Étienne. Contribution à la faune ichthyologique de la region du Cap Blanc (Mauritanie Française). Comité d'Études Historiques et Scientifiques de l'Afrique Occidentale Française, vol. 9, no. 2, p. 225-287.

The Spanish mackerel of the eastern Atlantic is listed under the name Cybium tritor as a distinct species.

Chaine, J. 1957. Recherches sur les otolithes des poissons. Étude descriptive et comparative de la sagitta des téléostéens (VII). Bulletin du Centre d'Etudes et de Recherches Scientifiques, Biarritz, vol. 1, no. 4, p. 463-557.

The otoliths of S. tritor (C. and V.) and other fishes are described.

Christmas, J.Y., G. Gunter, and E.C. Whatley. 1960. Fishes taken in the menhaden fishery of Alabama, Mississippi, and eastern Louisiana. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 339, 10 p.

S. maculatus was included in the catches of menhaden.

Christmas, J.Y., A. Perry, and R.S. Waller. 1974. Investigations of coastal pelagic fishes. U.S. Department of Commerce, National Marine Fisheries Service, Public Law 88-309, Project 2-128-R. Gulf Coast Research Laboratory, Ocean Springs, Miss. 105 p.

This work contains notes on the time of spawning, eggs, larvae, and foods of the king mackerel and Spanish mackerel. Length-weight data are plotted for S. maculatus.

Clark, J.R. 1962. The 1960 salt-water angling survey. U.S. Fish and Wildlife Service, Circular, no. 153, 36 p.

Three species of Scomberomorus, Spanish and king mackerels and cero, are included.

Claro, R., D.V. Radakov, Y.S. Reshetnikov, and A. Silva. 1974. Some features of the fish fauna of the Cuban shelf. Journal of Ichthyology, vol. 14, no. 1, p. 33-40.

S. cavalla is mentioned as a pelagic predator.

Coburn, C.B., Jr., and B.A. Fischer. 1973. Red blood cell hematology of fishes: A critique of techniques and a compilation of published data. *Journal of Marine Science*, vol. 2, no. 2, p. 37-58.

The compilation includes data (blood cell counts, hematocrit, and hemoglobin) for S. maculatus and S. cavalla.

Cole, J.S. 1976. Commercial fisheries survey and development. Puerto Rico Department of Agriculture, Agricultural and Fisheries Contributions, vol. 8, no. 3, 73 p.

Commercially important mackerels are referred to in reports as Scomberomorus sp. These fish are cero or king mackerel, or both. Experimental fisheries with gill nets proved ineffective for catching mackerels.

Collette, B.B. 1966. Revue critique des types de Scombridae des collections du Muséum National d'Histoire de Paris. *Bulletin du Muséum National d'Histoire Naturelle de Paris*, 2^e serie, vol. 38, no. 4, p. 362-375.

Types for S. cavalla and S. regalis are listed with synonymies and remarks.

Collette, B.B., and R.H. Gibbs, Jr. 1963. A preliminary review of the fishes of the family Scombridae, p. 23-32. In H. Rosa, Jr. (ed.), *Proceedings of the world scientific meeting on the biology of tunas and related species*. FAO Fisheries Reports, no. 6, vol. 3.

This section includes generic synonyms for Scomberomorus Lacépède.

Collette, B.B., and R.H. Gibbs, Jr. 1965. Cero, Scomberomorus regalis, p. 174-175. In A.J. McClane (ed.), McClane's standard fishing encyclopedia and international angling guide. Holt, Rinehart and Winston, New York.

The cero is distinguished from the king mackerel and Spanish mackerel by color characteristics. Meristics, size, range, and distribution are presented. A color illustration of a 5-pound male cero collected from Deep Water Cay, Bahamas, is included.

Collette, B.B., R.H. Gibbs, Jr., and E.C. Buckow. 1965a. King mackerel, *Scomberomorus cavalla*, p. 448-450. In A.J. McClane (ed.), McClane's standard fishing encyclopedia and international angling guide. Holt, Rinehart, and Winston, New York.

The king mackerel is distinguished from the other two western Atlantic members of the genus by the lack of black pigment in the anterior part of the first dorsal fin and by having fewer (15-16) spines in the first dorsal fin. Meristics, size range, distribution, and an extensive section on fishing techniques are presented. A color illustration of a 34-pound female captured at Palm Beach, Fla., is included.

Collette, B.B., R.H. Gibbs, Jr., and E.C. Buckow. 1965b. Spanish mackerel, *Scomberomorus maculatus*, p. 824-825. In A.J. McClane (ed.), McClane's standard fishing encyclopedia and international angling guide. Holt, Rinehart and Winston, New York.

The Spanish mackerel is distinguished from the cero and king mackerel by having spots on the sides and no stripes and lacking scales on the pectoral fins. Meristics, size, distribution, and fishing techniques are presented. A color illustration of a 5-pound male captured off Palm Beach, Fla., is included.

Collette, B.B., J.L. Russo, and L.A. Zavala-Camin. 1978. *Scomberomorus brasiliensis*, a new species of Spanish mackerel from the western Atlantic. U.S. National Marine Fisheries Service, Fishery Bulletin, vol. 76, no. 1, p. 273-280.

The Spanish mackerel of Central America and South American waters is identified as a new species, *Scomberomorus brasiliensis*. The species had previously been referred to as *S. maculatus*.

Collins, J.W. 1885. Edible qualities of smoked kingfish (*Scomberomorus cavalla*, Cuv.). Bulletin of the U.S. Fish Commission, vol. 5, p. 359.

The author notes that king mackerel, *S. cavalla*, tastes as good as halibut when it is smoked.

Collins, J.W. 1887. Report on the discovery and investigations of fishing grounds, made by the Fish Commission steamer Albatross during a cruise along the Atlantic coast and the Gulf of Mexico with notes on the Gulf fisheries. U.S. Commissioner of Fish and Fisheries Report for 1885, part 13, p. 217-305.

The description of the fisheries includes that for Spanish mackerel.

Collins, J.W. 1892. Statistical review of the coast fisheries of the United States. U.S. Commissioner of Fish and Fisheries, Report for 1888, part 16, p. 271-378.

Statistics include landings for the Spanish mackerel.

Collins, J.W., and H.M. Smith. 1892. Report on the fisheries of the New England States. Bulletin of the U.S. Fish Commission for 1890, vol. 10, p. 73-176.

S. maculatus landings and value by states are given for 1889.

Collins, J.W., and H.M. Smith. 1893. A statistical report on the fisheries of the Gulf States. Bulletin of the U.S. Fish Commission for 1891, vol. 11, p. 93-184.

S. caballa, *S. regalis*, and *S. maculatus* are listed as commercial fish. Landings and value are given by states for 1889 and 1890.

Collyer, E.C., and D.A. Aguiar. 1972. Sobre a produção pesqueira de alguns carraís-de-pesca do Ceará - dados de 1968 a 1970 [in Portuguese, English summary]. Boletim de Ciências do Mar, no. 24, p. 1-9.

Spanish mackerel (= S. brasiliensis) and king mackerel are caught in wooden fish weirs off the State of Ceará, Brazil.

Comeaux, G.T. 1942. Parasitic isopods of fishes from the Grande Isle, Louisiana, region. Proceedings of the Louisiana Academy of Sciences, vol. 6, p. 86.

A study of 26 species of fishes in the waters near Grand Isle, La., resulted in the finding of six species of isopods infesting 17 of the species of fishes and parasitising 1.7% of the total number. Five of the species, Aegathoa oculata, Nerocila acuminata, Livoneca ovalis, Cymothoa exigua, and C. excisa, caused the breaking of gill filaments and the formation of scar tissue at their place of attachment. One of the species, Olencira praegustator, did not show such damage to the host, including S. maculatus.

Compton, H. 1964. Survey of the fishes found in the inshore Gulf of Mexico and of the post-larval fishes in Aransas, Port Mansfield, and Port Isabel ship channels. Texas Parks and Wildlife Department, Coastal Fisheries Project Reports, p. 383-412.

In June, a post-larva of one of the mackerels (Scomberomorus sp.) was taken. The specimen was 7 mm in length.

Conrad, G.M. 1938. The osteology and relationships of the wahoo (Acanthocybium solandri), a scombroid fish. American Museum Novitates, no. 1000, 32 p.

This study includes a comparison of the osteology of the wahoo with other scombrids including the genus Scomberomorus.

Copeland, B.J. 1965. Fauna of the Aransas Pass Inlet, Texas. I. Emigration as shown by tide trap collections. University of Texas, Institute of Marine Science, Publications, vol. 10, p. 9-21.

Trap collections made at Aransas Pass Inlet included S. maculatus.

Corkum, K.C. 1959. Some trematode parasites of fishes from the Mississippi Gulf Coast. Proceedings of the Louisiana Academy of Science, vol. 22, p. 17-29.

Four S. maculatus were examined and no trematodes were found.

Corkum, K.C. 1968. Bucephalidae (Trematoda) in fishes of the northern Gulf of Mexico Bucephaliodes Hopkins, 1954 and Rhipidocotyle Diesing, 1858. Transactions of the American Microscopical Society, vol. 87, no. 3, p. 342-349.

New host records for S. maculatus, S. cavalla, Euthynnus alletteratus, and Lophius americanus are presented with taxonomic descriptions of the parasites and geographic variations.

Costa, R.S., and H.T. Almeida. 1974. Notas sôbre a pesca da cavala e da serra no Ceará - dados de 1971 a 1973 [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 14, no. 2, p. 115-122.

The study presents data on the age groups, size of the catch, number of hooks in the fishery, types of bait, catch and catch per unit effort for S. cavalla and S. maculatus (= S. brasiliensis).

Costa, R.S., and M.P. Paiva. 1963. Notas sôbre a pesca da cavala e da serra no Ceará - dados de 1962 [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 3, no. 1, p. 17-26.

The fishery biology of S. maculatus (= S. brasiliensis) and S. cavalla is presented, including the catches, monthly abundance, and length frequencies.

Costa, R.S., and M.P. Paiva. 1964. Notas sôbre a pesca da cavala e da serra no Ceará - dados de 1963 [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 4, no. 2, p. 71-81.

The catch of S. maculatus (= S. brasiliensis) and S. cavalla is presented by area, month, and method. The length frequencies and relation between rainfall and the catches are also discussed.

Costa, R.S., and M.P. Paiva. 1965. Notas sôbre a pesca da cavala e da serra no Ceará - dados de 1964 [in Portuguese, with English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 5, no. 2, p. 93-101.

The greatest indexes of monthly catches showed the existence of harvest in the periods from January to May and from November to December for the king mackerel, and the harvest for the Spanish mackerel (= S. brasiliensis) was restricted to the month of June and the period from October to December. The relationship between the indexes of monthly catches and the rainfall in the area was studied.

Costa, R.S., and M.P. Paiva. 1966. Notas sôbre a pesca da cavala e da serra no Ceará - dados de 1965 [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 6, no. 2, p. 195-204.

The fishery biology of S. cavalla and S. maculatus (= S. brasiliensis) including the catches, length frequencies, age groups, bait used, effort, and catch per unit effort are presented.

Costa, R.S., and M.P. Paiva. 1967. Notas sôbre a pesca da cavala e da serra no Ceará - dados de 1966 [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 7, no. 2, p. 181-190.

The fishery biology of S. cavalla and S. maculatus (= S. brasiliensis) off Ceará, Brazil, for 1966 is presented. Length frequencies, age groups, bait used, effort, and catch per unit effort are given.

Costa, R.S., and M.P. Paiva. 1968. Notas sôbre a pesca da cavala e da serra no Ceará - dados de 1967 [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 8, no. 2, p. 125-131.

The fishery biology of S. cavalla and S. maculatus (= S. brasiliensis) is presented. Catches, length frequencies, age groups, effort, bait used, and catch per unit effort are included in the study.

Costa, R.S., and M.P. Paiva. 1969. Notas sôbre a pesca da cavala e da serra no Ceará - dados de 1968 [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 9, no. 1, p. 89-95.

The fishery biology of S. cavalla and S. maculatus (= S. brasiliensis) including lengths, age groups, effort (hooks), baits used, numbers caught, and catch per unit effort are presented.

Costa, R.S., and M.P. Paiva. 1970. Notas sôbre a pesca da cavala e da serra no Ceará - dados de 1969 [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 10, no. 2, p. 147-152.

The fishery biology of S. cavalla and S. maculatus (= S. brasiliensis) is presented. Age groups and lengths of fish caught, effort (hooks), baits used, number caught, and catch per unit effort are included.

Costa, R.S., and M.P. Paiva. 1971. Notas sôbre a pesca da cavala e da serra no Ceará - dados de 1970 [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 11, no. 2, p. 133-137.

The fishery biology of S. cavalla and S. maculatus (= S. brasiliensis) is presented. Age and length distribution of the catch, effort (hooks), bait used, and catch per unit effort are included.

Cressey, R.F. 1975. A new family of parasitic copepods (Cyclopoida, Shiniidae). Crustaceana, vol. 28, no. 2, p. 211-219.

A new species, (Shinoa inauris), of copepod was collected from S. regalis and S. maculatus.

Cumming, K.B. 1967. Natural hemagglutinins in marine fishes. International Commission of the Northwest Atlantic Fisheries, Research Bulletin, no. 4, p. 59-66.

S. cavalla is one of the fishes crossmatched for determinations of natural hemagglutinins.

Cuvier, G. 1829. Le règne animal distribuë d'aprës son organisation, pour servir de base a l'histoire naturelle des animaux et d'introduction a l'anatomie comparëe, edition 2, 2, Poissons, p. 122-406. Paris.

This is the original description of S. cavalla after Guarapucu, Marcgrave, Brazil (From Rivas 1951).

Cuvier, G., and A. Valenciennes. 1831. Histoire naturelle des poissons, vol. 8. F.G. Levrault, Paris. 375 p.

Synonyms and descriptions are given for Cybium caballa, C. regale, C. maculatum, C. acervum. The latter is now synonymized with Scomberomorus regalis (Rivas 1951).

Dahl, G. 1971. Los peces del norte de Colombia. Instituto de Desarrollo de los Recursos Naturales Renovables (INDERENA), Bogotá. 391 p.

Taxonomic key, local common names, and size descriptions are given for cero, king and Spanish (= S. brasiliensis) mackerel.

Dahlberg, M.D. 1972. An ecological study of Georgia coastal fishes. U.S. National Marine Fisheries Service, Fishery Bulletin, vol. 70, no. 2, p. 323-353.

S. maculatus is included in the study and the occurrence and distribution for the species in the marsh areas is presented. A king mackerel was collected along the beach during an earlier study.

Dalrymple, B. 1968. Sportman's guide to game fish. World Publishing Co., New York. 480 p.

Color descriptions, seasonal occurrences, and schooling behavior are given, with emphasis on methods of recreational fishing for the king mackerel, Spanish mackerel, and cero.

Dawson, C.E. 1971. A bibliography of anomalies of fishes, supplement 2. Gulf Research Reports, vol. 3, no. 2, p. 215-239.

Reference is made to one instance (Bastos, 1965) of a body anomaly for S. maculatus (= S. brasiliensis).

Deng, J., R.T. Toledo, and D.A. Lillard. 1974. Effect of smoking temperature on acceptability and storage stability of smoked Spanish mackerel. *Journal of Food Science*, vol. 39, no. 3, p. 596-601.

The effect of temperature and smoking schedules on the quality of Spanish mackerel was evaluated using a pilot plant model of a commercial smokehouse system. Although the final moisture contents of the products are the same, the product smoked only at high temperature (160°F) had the softest texture.

de Sylva, D.P. 1954. Occurrence of an apparent hybrid mackerel (*Scomberomorus*) off Miami, Florida. *Copeia*, 1954, no. 3, p. 231-232.

An unusually marked 621-mm mackerel (*Scomberomorus*) was collected off Miami, Florida, on March 17, 1953. The gillraker count, the curvature of the lateral line, and the coloration of the first dorsal fin and the sides of the body appeared to be intermediate in character between the king mackerel, *S. cavalla*, and the Spanish mackerel, *S. maculatus*.

de Sylva D.P., and W.F. Rathjen. 1961. Life history notes on the little tuna, *Euthynnus alletteratus*, from the southeastern United States. *Bulletin of Marine Science of the Gulf and Caribbean*, vol. 11, no. 2, p. 161-190.

S. cavalla is one of several species in anglers' catches.

Deuel, D.G. 1973. 1970 salt-water angling survey. U.S. National Marine Fisheries Service, Current Fishery Statistics, no. 6200, 54 p.

The survey includes *S. cavalla*, *S. maculatus*, and *S. regalis*. Numbers of anglers, numbers of fish caught, and weight are presented by geographical area.

Deuel, D.G., and J.R. Clark. 1968. The 1965 salt-water angling survey. U.S. Bureau of Sport Fisheries and Wildlife, Resource Publication, no. 76, 51 p.

The survey includes S. cavalla, S. maculatus, and S. regalis. Numbers of anglers, number of fish, and weights are presented by geographic area.

DeVane, J.C., Jr. Food of king mackerel, Scomberomorus cavalla, in Onslow Bay, North Carolina. (In press) Transactions of the American Fisheries Society.

The stomach contents of 205 king mackerel, S. cavalla, collected in Onslow Bay, N.C., were mainly fish. In the 113 stomachs containing food, the dominant fishes were Atlantic menhaden and Atlantic thread herring. Spring and summer diets were clupeid specific; fall diets were more varied.

Dragovich, A. 1969. Review of studies of tuna food in the Atlantic Ocean. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 593, 21 p.

S. maculatus was found in the stomach of Euthynnus alletteratus.

Drennan, K.L., and H.R. Bullis, Jr. 1971. Aerial remote sensing reconnaissance of surface schooling fish, p. 41-42. In Proceedings of the symposium on investigations and resources of the Caribbean Sea and adjacent regions. FAO Fisheries Reports, no. 71.2.

Spectral reflectance measurements of S. maculatus were obtained.

Dresslar, F.B., and B. Fesler. 1889. A review of the mackerels (Scombridae) of America and Europe. Bulletin of the U.S. Fish Commission for 1887, vol 7, p. 429-446.

Keys, synonymies, common names, habitats, etymology, and size are discussed for S. maculatus, S. regalis, and S. cavalla.

Duarte-Bello, P., and R.J. Buesa. 1973. Catalogo de peces Cubanos (primera revision), I. Indice Taxonomico. Ciencias, Serie 8, Investigaciones Marinas, no. 3, 255 p.

Common names, synonyms, and distribution of S. cavalla, S. maculatus, and S. regalis are given.

Dunham, F. 1972. A study of commercially important estuarine-dependent industrial fishes. Louisiana Wild Life and Fisheries Commission, Technical Bulletin, no. 4, 63 p.

S. maculatus is included in the fish samples.

Dwinell, S.E., and C.R. Futch. 1973. Spanish mackerel and king mackerel larvae and juveniles in the northeastern Gulf of Mexico, June through October, 1969. Florida Department of Natural Resources, Marine Research Laboratory, Leaflet Series, vol. 4, pt. 1, no. 24, 14 p.

Spanish mackerel, S. maculatus, and king mackerel, S. cavalla larvae and juveniles were captured in surface or mid-depth/oblique plankton tows and at one nightlight station. A total of 188 S. maculatus larvae and juveniles (2.8-42.2 mm SL) were captured in June, August, and September, with smallest larvae (< 3.6 mm SL) occurring in those months, largest juveniles (ca 30 mm SL) in August. A total of 139 S. cavalla larvae and juveniles (2.8 and 13.5 mm SL) were captured in all months of sampling, with smallest larvae (ca 3.0 mm SL) occurring in June, August, and September.

Earll, R.E. 1883. The Spanish mackerel, Cybium maculatum (Mitch.); its natural history and artificial propogation, with an account of the origin and development of the fishery. U.S. Commissioner of Fish and Fisheries, Report for 1880, p. 395-426.

The Spanish mackerel spawned in the Carolinas in April, in Chesapeake Bay in June, and in the vicinity of Long Island during late August to the middle of September. This work also includes the following discussions: natural history, common name, description, distribution, movements, abundance, food, reproduction, origin and development of the fishery, fishing grounds, gear and methods, season by area, description of catch fishery statistics, artificial propogation, reasons for experiment and objectives, preparation for work, hatching operations, confirmation of experiments, practical results, and requirements for locating hatcheries.

Earll, R.E. 1884. Hatching blackfish and Spanish mackerel. Bulletin of the U.S. Fish Commission, vol. 4, p. 415-416.

Eggs of the Spanish mackerel, Cybium maculatum, are fertilized and hatched.

Earll, R.E. 1887. The Spanish mackerel fishery, p. 543-552. In G.B. Goode (ed.), The fisheries and fishery industries of the United States, section 5, vol. 1. U.S. Commission of Fish and Fisheries, Washington, D.C.

This article describes fishing grounds, methods of capture, seasons by localities, disposition of catch, and fishery statistics by states for the year 1880 for Spanish mackerel.

Eckles, H.H. 1949. Observations on juvenile oceanic skipjack (Katsuwonus pelamis) from Hawaiian waters and sierra mackerel (Scomberomorus sierra) from the eastern Pacific. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 48, no. 51, p. 245-250.

Comparisons are made of juvenile S. sierra and S. maculatus referring to other works. One S. maculatus (= S. brasiliensis) specimen (167 mm) from Brazil was X-rayed by the author and the vertebral count was $19 + 20 = 39$.

Edmunds, W.J., and R.R. Eitenmiller. 1975. Effect of storage time and temperature on histamine content and histidine decarboxylase activity of aquatic species. *Journal of Food Science*, vol. 40, no. 3, p. 516-519.

An investigation was undertaken to determine the effect of storage time and temperature on histamine content and histidine decarboxylase activity in Spanish mackerel (*S. maculatus*), and other species of fishes.

Ehrenbaum, E. 1924. Scombriformes. Report of the Danish Oceanographic Expedition, 1908-1910, to the Mediterranean and Adjacent Seas, vol. 2, Biology, no. 8(A-11), p. 1-42.

An undetermined species of *Scomberomorus* from Togo Coast, West Africa is figured and discussed.

Eisler, R. 1965. Erythrocyte counts and hemoglobin content in nine species of marine teleosts. *Chesapeake Science*, vol. 6, no. 2, p. 119-120.

S. cavalla and *S. maculatus* data from Engel and Davis (1964) are cited.

Eldridge, P.J., F.H. Berry, and M.C. Miller, III. 1977. Test results of the Boothbay neuston net related to net length, diurnal period, and other variables. South Carolina Marine Resources Center, Technical Report no. 18, 21 p.

Forty-one larval (5-10 mm) *S. cavalla* were caught. Thirty-nine were captured at night.

Ellis, R.W. 1957. Catches of fish by charter boats on Florida's east coast. University of Miami, Marine Laboratory, Special Service Bulletin, no. 14, 6 p.

Catch records were obtained by interviews and from log book entries of Florida's east coast charter boat captains and anglers. Records of 443 trips were documented between February 1, 1956 and January 31, 1957. King mackerel and Spanish mackerel accounted for 18.2% and 9.3%, respectively, of the total number of fish caught.

Engel, D.W., and E.M. Davis. 1964. Relationships between activity and blood composition in certain marine teleosts. *Copeia*, 1964, no. 3, p. 586-587.

Blood characteristics (red blood cell and white blood counts, hematocrit, hemoglobin, and thrombocytes) are given for S. cavalla and S. maculatus.

Erdman, D.S. 1949. Does the Spanish mackerel, Scomberomorus maculatus (Mitchill), occur throughout the West Indies? *Copeia*, 1949, no. 4, p. 301.

Comments on the distributions and keys for S. cavalla, S. regalis, and S. maculatus are included.

Erdman, D.S. 1956. Recent fish records from Puerto Rico. *Bulletin of Marine Science of the Gulf and Caribbean*, vol. 6, no. 4, p. 315-340.

A discussion of the distribution of S. maculatus, S. regalis, and S. cavalla and spawning periods of S. regalis and S. cavalla are included.

Erdman, D.S. 1971. Notes on fishes from the Gulf of Nicoya, Costa Rica. *Revista de Biología Tropical*, vol. 19, no. 1-2, p. 59-71.

The "sierra," S. sierra, is compared to the Spanish mackerel, S. maculatus, by vertebral count and size, and to the cero, S. regalis, by vertebral count and total gill raker count.

Erdman, D.S. 1976. Spawning patterns of fishes from the northeastern Caribbean. *Puerto Rico Department of Agriculture, Agricultural and Fisheries Contributions*, vol. 8, no. 2, 36 p.

S. cavalla were in spawning condition mainly in July and August, but one female with translucent ova was found as early as April 10 and a ripe male as late as November 12. S. regalis showed less peaked and more extensive spawning, virtually all year.

Escurdero González, F.A. 1976. Artes y metodos de pesca empleados en la captura de sierra en la jurisciccion pesquera del puerto de Veracruz (1974-1975), p. 255-269. In Memorias. Reunion sobre los Recursos de Pesca Costera de Mexico, Veracruz, Ver. Mexico. Instituto Nacional de Pesca, Mexico.

This paper describes the fishing gear and methods used by the fishermen in the S. maculatus fishery of the coast of Veracruz, Mexico. The different fishing gear are also figured.

Evermann, B.W. 1904. Statistics of the fisheries of the Middle Atlantic States. U.S. Commissioner of Fish and Fisheries, Report for 1902, part 27, p. 433-540.

Commercial data for kingfish and Spanish mackerel for 1901 are given.

Evermann, B.W., and B.A. Bean. 1898. Indian River and its fishes. U.S. Commissioner of Fish and Fisheries, Report for 1896, part 22, p. 227-248.

S. maculatus is taken occasionally in the commercial landings.

Evermann, B.W., and W.C. Kendall. 1900. Check-list of the fishes of Florida. U.S. Commissioner of Fish and Fisheries, Report for 1889, part 25, p. 35-103.

S. maculatus, S. regalis, and S. cavalla are listed, with synonymies for each species.

Evermann, B.W., and M.C. Marsh. 1902. The fishes of Porto Rico. Bulletin of the U.S. Fish Commission for 1900, vol. 20, part 1, p. 49-350.

Taxonomic keys and general descriptions are provided for S. maculatus, S. cavalla, and S. regalis. Seasonal occurrence and notes on the spawning and recreational fishing for S. cavalla are also given.

Ewald, J.J., W. Brandhorst, F.H. Durant, V. Espinosa, and W. Diaz. 1971. Cruceros de pesca exploratoria del arrastrero "Carmelina" en la zona occidental de Venezuela [in Spanish, English summary]. Proyecto de Investigacion y Desarrollo Pesquero, MAC-PNUD-FAO, Caracas, Informe Technico no. 24. 58 p.

The article includes catches and relative abundance of S. maculatus (= S. brasiliensis) caught in trawl.

Fable, W.A., Jr., and C.H. Saloman. 1974. The recreational fishery on three piers near St. Petersburg, Florida during 1971. *Marine Fisheries Review*, vol. 36, no. 10, p. 14-18.

Spanish mackerel, S. maculatus, was the second most abundant species caught. A few S. cavalla were also landed by recreational fishermen.

Fadul, A.C. 1968. The marine fisheries of Colombia and their statistics. Proceedings of the Gulf and Caribbean Fisheries Institute, 20th Annual Session, 1967, p. 133-144.

S. maculatus (= S. brasiliensis) and S. cavalla are listed among the fishes eaten in Columbia.

Fagade, S.O., and C.I.O. Olaniyan. 1973. The food and feeding interrelationship of the fishes in the Lagos Lagoon. *Journal of Fish Biology*, vol. 5, no. 2, p. 205-225.

The food of S. maculatus was mainly Ethmalosa fimbriata.

Fahay, M.P. 1975. An annotated list of larval and juvenile fishes captured with surface-towed meter net in the South Atlantic Bight during four RV Dolphin cruises between May 1967 and February 1968. U.S. National Marine Fisheries Service, Special Scientific Report-- Fisheries, no. 685, 39 p.

Four S. maculatus were caught in May-August with FL range of 20.8 to 27.1 mm.

Farragut, R.N. 1972. Effects of some antioxidants and EDTA on the development of rancidity in Spanish mackerel (Scomberomorus maculatus) during frozen storage. U.S. National Marine Fisheries Service, Special Scientific Report-- Fisheries, no. 650, 12 p.

Spanish mackerel (S. maculatus) fillets were treated with various antioxidant solutions. Samples analyzed at 3-month intervals showed fillets packed in vacuum and treated with EDTA remained in good condition over the 12-month storage period. However, samples treated with (Na)₄ EDTA remained superior to other samples throughout the storage period.

Fiedler, R.H. 1929a. Trade in fresh and frozen fishery products and related marketing considerations in Atlanta, Georgia. U.S. Bureau of Fisheries, Report for 1928, part 1, p. 43-60.

S. regalis, S. cavalla, and S. maculatus are included in market fishes.

Fiedler, R.H. 1929b. Trade in fresh and frozen fishery products and related marketing considerations in Jacksonville, Florida. U.S. Bureau of Fisheries, Report for 1928, part 1, p. 1-26.

S. regalis, S. cavalla, and S. maculatus are included among the fishes handled by wholesale and retail fish dealers.

Fiedler, R.H. 1930. Fishery industries of the United States, 1928. U.S. Bureau of Fisheries, Report for 1929, p. 401-625.

S. regalis, S. cavalla, and S. maculatus are listed in the catches of South Atlantic and Gulf states.

Fiedler, R.H. 1931. Fishery industries of the United States, 1929. U.S. Bureau of Fisheries, Report for 1930, p. 705-1068.

S. regalis, S. cavalla, and S. maculatus are included in the landing statistics.

Fiedler, R.H. 1932. Fishery industries of the United States, 1930. U.S. Bureau of Fisheries, Report for 1931, p. 109-552.

S. regalis, S. cavalla, and S. maculatus are included in the landing statistics.

Fiedler, R.H. 1933. Fishery industries of the United States, 1931. U.S. Bureau of Fisheries, Report for 1932, p. 97-440.

S. regalis, S. cavalla, and S. maculatus are included in the landings statistics.

Fiedler, R.H. 1934. Fishery industries of the United States, 1933. U.S. Bureau of Fisheries, Report for 1933, p. 149-449.

Cero, king mackerel, and Spanish mackerel are included in the listings.

Fiedler, R.H. 1936. Fishery industries of the United States, 1934. U.S. Bureau of Fisheries, Report for 1935, p. 75-330.

S. regalis, S. cavalla, and S. maculatus are included in the listings.

Fiedler, R.H. 1938. Fishery industries of the United States, 1935. U.S. Bureau of Fisheries, Report for 1936, p. 73-348.

S. regalis, S. cavalla, and S. maculatus are included in the listings.

Fiedler, R.H. 1939. Fishery industries of the United States, 1936. U.S. Bureau of Fisheries, Report for 1937, p. 1-276.

S. regalis, S. cavalla, and S. maculatus are included in the listings.

Fiedler, R.H. 1940. Fishery industries of the United States, 1937. U.S. Bureau of Fisheries, Report for 1938, p. 151-460.

S. regalis, S. cavalla and S. maculatus are included in the listings.

Fiedler, R.H. 1941. Fishery industries of the United States, 1938. U.S. Bureau of Fisheries, Report for 1939, p. 169-554.

S. regalis, S. cavalla, and S. maculatus are included in the listings.

Fiedler, R.H. 1950. Fishery industries of the United States, 1939. U.S. Bureau of Fisheries, Report for 1940, p. 185-554.

S. regalis, S. cavalla, and S. maculatus are included in the listings.

Fiedler, R.H., and N.D. Jarvis. 1932. Fisheries of the Virgin Islands of the United States. U.S. Bureau of Fisheries, Investigational Report, vol. 1, no. 14. 32 p.

Spanish and king mackerel were caught by trolling off the Virgin Islands.

Fiedler, R.H., J.R. Manning, and F.F. Johnson. 1936. Fishery industries of the United States, 1933. U.S. Bureau of Fisheries, Report for 1934, p. 237.

S. regalis, S. cavalla, and S. maculatus are included in the listings.

Fiedler, R.H., and J.H. Matthews. 1926. Wholesale trade in fresh and frozen fishery products and related marketing considerations in New York City. U.S. Bureau of Fisheries, Report for 1925, p. 183-217.

Kingfish, also known as king mackerel or cero, S. regalis, and Spanish mackerel, S. maculatus, were obtainable in season in the wholesale fish markets of New York City from South Carolina, Georgia, and Florida.

Fish, M.P., and W.H. Mowbray. 1970. Sounds of western North Atlantic fishes. Johns Hopkins Press, Baltimore. 207 p.

Mechanical noise of S. maculatus and S. regalis was monitored.

Florida Department of Natural Resources. 1959 - . Summary of Florida commercial marine landings. Florida Department of Natural Resources, Division of Marine Resources, Tallahassee.

Catch and effort statistics are tabulated and illustrated graphically for shrimp, mullet, Spanish mackerel, red snapper, menhaden, and other spp., and analyzed by county. Quantities and values are given for a period of several years, by years and months. Appendices describe the mechanics of the fish ticket program, list common and scientific names of spp., and provide a bibliography.

Fonteles, A.A., Filho. 1968. Sobre a captura e abundância da cavala e da serra vos pesqueiros do Estado do Ceará [in Portuguese, English summary]. Arquivos da Estação Biologia de Marinha da Universidade Federal do Ceará, vol. 8, no. 2, p. 133-137.

The main fishing grounds for the king mackerel, *S. cavalla* (Cuvier), and Spanish mackerel, *S. maculatus* (= *S. brasiliensis*) (Mitchill), off the State of Ceará, Brazil, are located between 6 and 16 nautical miles from the coast line. The fishery is from rafts with trawling hook lines baited chiefly with Atlantic thread herring. In general, the highest indexes of abundance were in the first and fourth quarters of the years.

Fontenot, B.J., Jr., and H.E. Rogillio. 1970. A study of estuarine sportfishes in the Biloxi marsh complex, Louisiana. Louisiana Wild Life and Fisheries Commission, Dingell-Johnson Project Completion Report, F8. 172 p.

The Spanish mackerel is listed in a table of fishes collected during the survey. Chemical and physical conditions at the time of sampling are provided.

Fowler, H.W. 1905. New, rare or little known scombroids, no. 1. Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 56, p. 757-771.

Synonyms, meristics, and morphometrics are given for S. regalis and S. cavalla. In a discussion of S. argyreus, the author remarks this fish differs from S. tritor in the fin radii, and cannot be identical to S. cavalla as suggested earlier by Dresslar and Fesler (1889).

Fowler, H.W. 1915. The fishes of Trinidad, Grenada, and St. Lucia, British West Indies. Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 67, p. 520-546.

S. regalis is not uncommon in the fish markets in Trinidad.

Fowler, H.W. 1927. Notes on fishes at Chincoteague, Virginia, 1926. Copeia, no. 165, p. 89-90.

Collections made by Mr. J.W. Fox in May, and October, include one S. maculatus in the spring.

Fowler, H.W. 1936. Marine fishes of West Africa. Bulletin of the American Museum of Natural History, vol. 70, no. 2, p. 607-1493.

Description and synonymy of genus Scomberomorus and of S. maculatus are presented.

Fowler, H.W. 1944. Results of the Fifth George Vanderbilt Expedition (1941) (Bahamas, Caribbean Sea, Panama, Galápagos Archipelago and Mexican Pacific Islands). The fishes. Academy of Natural Sciences of Philadelphia, Monograph no. 6, p. 57-529.

Synonymies, descriptions, and localities of S. cavalla, S. maculatus, and S. regalis are presented.

Fowler, H.W. 1945. A study of the fishes of the southern piedmont and coastal plain. Academy of Natural Sciences of Philadelphia, Monograph no. 7, 408 p.

Synonymies and descriptions of S. maculatus and S. regalis are discussed.

Fowler, H.W. 1953. The shore fishes of the Colombian Caribbean. Caldasia, vol. 6, no. 27, p. 43-73.

Fishes identified at the fish market at Cartagena are listed. Included are 60 S. maculatus (= S. brasiliensis), locally referred to as "carite," approximately 32 S. regalis, locally called "sierra" or "sierra pintada," and many S. cavalla, called "carite" or "peto." The dates observed and lengths of the fish are given.

Franks, J.S., J.Y. Christmas, W.L. Siler, R. Combs, R. Waller, and C. Burns. 1972. A study of nektonic and benthic faunas of the shallow Gulf of Mexico off the State of Mississippi as related to some physical, chemical, and geological factors. Gulf Research Reports, vol. 4, no. 1, p. 1-148.

S. maculatus were caught by trawl. Fish weights, temperature and salinity at capture sites, discussion of seasonal occurrence, and the fishery are included.

Fraser-Brunner, A. 1950. The fishes of the family Scombridae. Annals and Magazine of Natural History, Series 12, vol. 3, no. 26, p. 131-163.

Phylogenetic order, taxonomic key, and synonyms are provided for members of the genus Scomberomorus. S. cavalla, S. maculatus, and S. regalis are included.

Freeman, B.L., and L.A. Walford. 1974. Anglers' guide to the United States Atlantic coast fish, fishing grounds and fishing facilities. Section IV. Delaware Bay to False Cape, Virginia. U.S. National Marine Fisheries Service, Washington, D.C., 17 p.

Physical descriptions, habits, temperature range, and recreational fishing areas, seasons, and methods are presented for the king mackerel and Spanish mackerel.

Freeman, B.L., and L.A. Walford. 1976a. Anglers' guide to the United States Atlantic coast fish, fishing grounds, and fishing facilities. Section VI. False Cape, Virginia to Altamaha Sound, Georgia. U.S. National Marine Fisheries Service, Washington, D.C., 21 p.

Physical descriptions, habits, temperature range, and recreational fishing areas, seasons, and methods are presented for the king mackerel and Spanish mackerel.

Freeman, B.L., and L.A. Walford. 1976b. Anglers' guide to the United States Atlantic Coast fish, fishing grounds and fishing facilities. Section VII. Altamaha Sound, Georgia to Fort Pierce Inlet, Florida. U.S. National Marine Fisheries Service, Washington, D.C., 21 p.

Physical descriptions, habits, temperature range, and recreational fishing areas, seasons, and methods are presented for the king mackerel and Spanish mackerel.

Freeman, B.L., and L.A. Walford. 1976c. Anglers' guide to the United States Atlantic Coast fish, fishing grounds and fishing facilities. Section VIII. St. Lucie Inlet, Florida to the Dry Tortugas. U.S. National Marine Fisheries Service, Washington, D.C., 25 p.

Physical descriptions, habits, temperature range, and recreational fishing areas, seasons, and methods are presented for the king mackerel, Spanish mackerel, and cero.

Frost, G.A. 1938. A comparative study of the otoliths of the neopterygian fishes. Suborder Scombroidea. Annals and Magazine of Natural History, series 10, vol. 2, p. 328-331.

The sagittae of S. regalis are described. Otoliths of S. maculatus are mentioned as resembling S. regalis.

Gesteira, T.C.V. 1972. Sobre a reprodução e fecundidade da serra, Scomberomorus maculatus (Mitchill), no Estado do Ceará [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 12, no. 2, p. 117-122.

Data on 2,094 females caught by trolling lines were analyzed in this study on the reproduction and fecundity of the Spanish mackerel, S. maculatus (Mitchill) (= S. brasiliensis), from Ceará, Brazil. Formulas for fecundity with age, fork length, and weight are presented. Females mature at 46.0 cm FL, between 3 and 4 years old.

Gesteira, T.C.V., and A.L.L. Mesquita. 1973. Curvas de rendimento da cavala, Scomberomorus cavalla (Cuvier), e da serra, Scomberomorus maculatus (Mitchill), no Estado do Ceará (Brasil) [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 13, no. 1, p. 13-15.

The relationship between total annual catch (C) and fishing effort (E) for S. cavalla and S. maculatus (= S. brasiliensis), caught along the coast of Ceará State (Brazil) were studied. The results were: 1) for king mackerel -C = (1.201-0.107 E), maximum catch = 3.4×10^6 kg for effort = 5.6×10^6 hooks/day; 2) for Spanish mackerel -C = (1.009-0.062 E) E, maximum catch = 4.1×10^6 kg for effort = 8.1×10^5 hooks/day; 3) for king and Spanish mackerel -C = (2.210-0.169 E) E, maximum catch = 7.2×10^6 kg for effort = 6.5×10^6 hooks/day.

Gilbert, C.R., and D.P. Kelso. 1971. Fishes of the Tortuguero area, Caribbean Costa Rica. Bulletin of the Florida State Museum, Biological Sciences, vol. 16, no. 1. 54 p.

S. maculatus (= S. brasiliensis) is included in the list of fishes collected.

Gill, T. 1873. Catalogue of the fishes of the east coast of North America. U.S. Commissioner of Fish and Fisheries, Report for 1871-72, part 19, p. 779-822; also, Smithsonian Miscellaneous Collection, vol. 14, art. 2, 25 p.

Cybium maculatus and C. regale are included in a list of fishes with their respective east coast distributions.

Gines, H., and F. Cervigon. 1968a. Exploracion pesquera en las costas de Guayana y Surinam año 1967. Estación de Investigaciones Marinas de Margarita, Fundación La Salle de Ciencias Naturales, Caracas, Venezuela, Contribución, no. 29, 69 p.

S. maculatus (= S. brasiliensis) and S. cavalla are listed in the catches by trawl sampling stations.

Gines, H., and F. Cervigon. 1968b. Exploratory fishing in the southern Caribbean and northern Atlantic coasts of South America. Proceedings of the Gulf and Caribbean Fisheries Institute, 20th Annual Session, 1967, p. 145-158.

S. maculatus (= S. brasiliensis) and S. cavalla are mentioned as market fish.

Gines, H., F. Cervigon, and R. Gomez. 1971. Pesca exploratoria en la costa N y NE de Sur-America, p. 57-93. In Proceedings of the symposium on the investigations and resources of the Caribbean Sea and adjacent regions. FAO Fisheries Report, no. 71.2.

The time, date, and location of catches are given for S. cavalla and S. maculatus (= S. brasiliensis) caught off the north and northernmost coast of South America.

Goode, G.B. 1884. The Spanish mackerel and its allies, p. 307-316. In G.B. Goode (ed.), The fisheries and fishery industries of the United States, section 1, part 3, no. 98. U.S. Commission of Fish and Fisheries, Washington, D.C.

Description, distribution, seasonal occurrence, commercial and recreational fishing, migrations, and notes on the reproduction (citing earlier works) are provided for the Spanish mackerel. Reference is made to the distribution of the king mackerel and cero. Figures of the three species are found in Section I, Plates, by the author, 1884, plates 93-94.

Goode, G.B. 1887. The fisheries and fishery industries of the United States. Section II. A geographical review of the fisheries industries and fishing communities for the year 1880. U.S. Commission of Fish and Fisheries, Washington, D.C., 787 p.

The fisheries for S. maculatus are described for states on the Atlantic coast.

Goode, G.B. 1903. American fishes, a popular treatise upon the game and food fishes of North America, with a special reference to habits and methods of capture. New ed., completely revised and largely extended by Theodore Gill. L.C. Page and Co., Boston. 562 p.

The author cites earlier works in a discussion of the Spanish mackerel which includes synonyms, description, distribution, seasonal occurrence, reproduction, behavior, foods, and commercial and recreational fishing. The description and distribution is also provided for the cero and an illustration labeled "silver cero" is probably S. cavalla.

Goode, G.B., and T.H. Bean. 1882. A list of the species of fishes recorded as occurring in the Gulf of Mexico. Proceedings of the U.S. National Museum, vol. 5, p. 234-240.

Nearly 300 species are enumerated in this list prepared in 1881. Included under Scombridae are S. regalis and S. caballa.

Goode, G.B., and T.H. Bean. 1895. Oceanic ichthyology, a treatise on the deep-sea and pelagic fishes of the world, based chiefly upon the collections made by the steamers Blake, Albatross, and Fish Hawk in the north-western Atlantic. Smithsonian Institution, U.S. National Museum, Special Bulletin, no. 2, 553 p.

A key to genera of scombrids is presented including Scomberomorus (no mention is made of species of Scomberomorus).

Gorbunova, N.N., and D. Salabarría. 1968. Reproduction of scombroid fishes (Pisces, Scombroidei) in western regions of the Atlantic Ocean. (Transl. from Russian and Spanish). Inter-American Tropical Tuna Commission, La Jolla, Calif. 23 p.

The spawning of all scombroid fishes (including the Spanish mackerel, cero, and king mackerel) inhabiting the Caribbean-Mexican basin occurs in the spring-summer season. Spawning of the temperate water species, including the three above, starts at water temperature below 25°C. Larvae of the scombroid fishes were caught outside of the zones of the continental shelf and were not encountered in the coastal regions. Mackerel larvae were predominant near the edge of the continental shelf with greatest frequency of occurrences in the 0-50 m layer and most common from a depth of 25 m.

Gordon, B.L. 1960. The marine fishes of Rhode Island. The Book and Tackle Shop, Watch Hill, R.I. 136 p.

The Spanish mackerel is mentioned as a southern species of no economic importance in Rhode Island waters. One fish, 29-inches, was caught by trolling. The cero is also mentioned as rare and usually taken in autumn in Narragansett Bay.

Gowanloch, J.N., and J.B. Davenhauer, Jr. 1932. Sea fishes and sea fishing in Louisiana. Louisiana Department of Conservation, Bulletin, 21. 187 p.

Methods of fishing, description, and biology of S. maculatus are presented.

Gray, I.E. 1954. Comparative study of the gill area of marine fishes. Biological Bulletin (Woods Hole), vol. 107, no. 2, p. 219-225.

Two S. maculatus were included in this study. Data on the gill area (mm^2) per g of body weight and per mm^2 of body surface are presented.

Gregory, W.K. 1933. Fish skulls: A study of the evolution of natural mechanisms. Transactions of the American Philosophical Society, vol. 23, art. 2, 481 p.

The dorsal view of a Scomberomorus skull is illustrated.

Griffiths, R.C. 1971. The tuna fishery of Venezuela with notes on other scombroids of potential commercial value, p. 95-109. In Proceedings of the Symposium on the Investigations and Resources of the Caribbean Sea and adjacent region. FAO Fisheries Report, no. 71.2.

The potential of S. maculatus (= S. brasiliensis) and S. cavalla as commercially valuable species is discussed.

Griffiths, R.C., and M. Martinez. 1972. Desarrollo de un sistema de procesamiento automatico de datos biologicos pesqueros [in Spanish, English summary]. Proyecto de Investigacion y Desarrollo Pesquero, MAC-PNUD-FAO, Caracas, Informe Tecnico no. 54, 38 p.

An automatic data processing system was developed for analyzing biometrics, age and growth, and catch and effort for S. maculatus (= S. brasiliensis) and S. cavalla and other important species.

Griffiths, R.C., and J.G. Simpson. 1972. An evaluation of the present levels of exploitation of the fishery resources of Venezuela [in Spanish and English]. Venezuela Ministerio de Agricultura y Cría, Oficina Nacional de Pesca, Serie Recursos y Explotacion Pesqueros, vol. 2, no. 5, 52 p.

Presently underutilized fisheries for S. maculatus (= S. brasiliensis) and S. cavalla are discussed.

Griffiths, R.C., and J.G. Simpson. 1973. The present status of the exploitation and evaluation of the fishery resources of Venezuela. Proceedings of the Gulf and Caribbean Fisheries Institute, 25th Annual Session, 1972, p. 129-155.

This article mentions the fisheries for S. maculatus (= S. brasiliensis) and S. cavalla off Venezuela.

Grimes, C.B. 1971. Thermal addition studies of the Crystal River steam electric station. Florida Department of Natural Resources, Marine Research Laboratory, Professional Paper Series, no. 11, 53 p.

One S. maculatus was caught in the screen wash of the steam electric station.

Gunter, G. 1945. Studies on marine fishes of Texas. University of Texas, Institute of Marine Science, Publications, vol. 1, p. 9-190.

In summer the Spanish mackerel, S. maculatus, and other large scombrids and game fishes approach the Gulf shore of Texas and some of the mackerel actually enter the bays. As the temperature drops in the fall, the exodus of the shrimp and many fishes starts and the cycle is completed. Spanish mackerel were collected where the salinity was 30 o/oo or greater.

Gunter, G. 1967a. Some relationships of estuaries to the fisheries of the Gulf of Mexico, p. 621-638. In George H. Lauff (ed.), Estuaries. American Association for the Advancement of Science, Publication no. 83.

Includes 1961 commercial catches of S. cavalla, S. regalis, and S. maculatus.

Gunter, G. 1967b. Vertebrates in hypersaline waters. University of Texas, Institute of Marine Science, Contributions in Marine Science, vol. 12, p. 230-241.

Occasionally Spanish mackerel enter lower salinity areas of the Laguna Madre. They are absent from the high salinity Laguna.

Hammond, D.L., D.O. Myatt, and D.M. Cupka. 1977. Evaluation of midwater structures as a potential tool in the management of the fisheries resources on South Carolina's artificial fishing reefs. South Carolina Marine Resources Center, Technical Report Series, no. 15, 19 p.

Midwater artificial reef structures are described. Spanish mackerel and king mackerel were caught more frequently around these structures than any other species.

Hargis, W.J., Jr. 1956. Monogenetic trematodes of Gulf of Mexico fishes. Part XII. The Family Gastrocotylidae Price, 1943. Bulletin of Marine Science of the Gulf and Caribbean, vol. 6, no. 1, p. 28-43.

S. maculatus and S. cavalla are both listed as hosts.

Hastings, R.W., L.H. Ogren, and M.T. Mabry. 1976. Observations on the fish fauna associated with offshore platforms in the northeastern Gulf of Mexico. U.S. National Marine Fisheries Service, Fishery Bulletin, vol. 74, no. 2, p. 387-402.

Several king mackerel, S. cavalla, were observed around the platforms in summer and fall.

Heald, E.J. 1970. Fishery resources atlas. I. New York to Florida. University of Miami, Sea Grant Technical Bulletin, no. 3, 225 p.

The general range of S. cavalla is from Chesapeake Bay to Brazil. The commercial fishery (1965) of North Carolina caught 139,000 pounds and Florida landed 2,549,000 pounds. Sport fishing is important in North Carolina and Florida and the species is occasionally caught in pound nets in the lower Chesapeake Bay, although rarely recorded from the upper Chesapeake Bay above the Potomac. S. maculatus ranges from Maine to Brazil. The commercial fishery (1965) of North Carolina landed 117,000 pounds. The sport fishery is important from Cape Hatteras, N.C., southward.

Helm, T. 1976. Dangerous sea creatures - a complete guide to hazardous marine life. Funk and Wagnalls, New York. 278 p.

A fisherman was bitten by S. maculatus while mackerel were surrounded in a net, and the fishermen were going into water to free the snagged net.

Henshall, J.A. 1891. Report upon a collection of fishes made in southern Florida during 1889. Bulletin of the U.S. Fish Commission for 1889, vol. 9, p. 371-389.

S. maculatus is listed with other species collected off southern Florida.

Henshall, J.A. 1895. Notes on fishes collected in Florida in 1892. Bulletin of the U.S. Fish Commission for 1894, vol. 14, p. 209-221.

S. maculatus, S. cavalla, and S. regalis are listed. The size, range, and fishery are described for each species in the Tampa area and Key West.

Herald, E.S. 1972. Fishes of North America. Doubleday and Co., New York. 254 p.

Comments are made on distribution and maximum size of S. regalis, S. cavalla, and S. maculatus.

Hickey, C.R., Jr., A.D. Sosnow, and J.W. Lester. 1975. Pound net catches of warm-water fishes at Montauk, New York. New York Fish and Game Journal, vol. 22, no. 1, p. 38-50.

A total of 620 warm-water fishes representing seven families and 14 species was captured in two commercial pound nets, Fort Pond Bay at Montauk, N.Y., July 9 to August 30, and from October 3 to 30 in 1973. Two Spanish mackerel were among those caught. Both were over 250 mm TL and were captured on August 29 when the water temperature was 22.6°C.

Higgins, E., and R. Lord. 1927. Preliminary report on the marine fisheries of Texas. U.S. Bureau of Fisheries, Report for 1926, p. 167-199.

S. maculatus is included as one of the marine commercial species. Landings are given and the fishery is described.

Higgins, E., and J.C. Pearson. 1928. Examination of the summer fisheries of Pamlico and Core Sounds, N.C., with special reference to the destruction of undersized fish and the protection of the gray trout, Cynoscion regalis (Bloch and Schneider). U.S. Bureau of Fisheries, Report for 1927, p. 29-65.

S. maculatus is listed in catches by long-haul seines and in pound nets in North Carolina estuarine areas in 1925.

Hildebrand, H.H. 1954. A study of the fauna of the brown shrimp (Penaeus aztecus Ives) grounds in the western Gulf of Mexico. University of Texas, Institute of Marine Science, Publications, vol. 3, no. 2, p. 233-366.

Spanish mackerel, S. maculatus, were collected by trawl during a survey of the shrimping grounds. The species was recorded from the following dates and locations: October, between Pass Cavallo and Colorado River, 3-8 fathoms; December, off Pass Cavallo, 10-11 fathoms; October, northern half of the Texas grounds, 12-18 fathoms; and January, off Corpus Christi Pass, 18-24 fathoms.

Hildebrand, H.H. 1955. A study of the fauna of the pink shrimp (Penaeus duorarum Burkenroad) grounds in the Gulf of Campeche. University of Texas, Institute of Marine Science, Publications, vol. 4, no. 1, p. 169-232.

Depths, locations, and dates are given for four S. maculatus caught in a shrimp trawl.

Hildebrand, S.F., and L.E. Cable. 1938. Further notes on the development and life history of some teleosts at Beaufort, N.C. Bulletin of the U.S. Bureau of Fisheries, vol. 48, no. 24, p. 505-642.

The development of the larvae and postlarvae of S. maculatus is shown by descriptions and figures. Distinguishing characters of the adults and young, the place and season of spawning, the relative abundance of adults and young, as well as the habitat of adults and young are discussed.

Hildebrand, S.F., and W.C. Schroeder. 1927. Fishes of Chesapeake Bay. Bulletin of the U.S. Bureau of Fisheries, vol. 43, part 1, 366 p.

Synonymies and descriptions are given for S. maculatus and S. regalis. Notes on the commercial fishery, time of spawning, migration, and seasonal occurrence are provided for Spanish mackerel and the distribution is given for the cero.

Hinegardner, R., and D.E. Rosen. 1972. Cellular DNA content and the evolution of teleostean fishes. American Naturalist, vol. 106, no. 951, p. 621-644.

Haploid DNA content (pg) is given for S. maculatus and S. cavalla.

Hoese, H.D. 1958. A partially annotated checklist of the marine fishes of Texas. University of Texas, Institute of Marine Science, Publications, vol. 5, p. 312-352.

The list includes S. cavalla, S. maculatus, and S. regalis from Texas.

Hoese, H.D. 1973. A trawl study of nearshore fishes and invertebrates of the Georgia coast. University of Texas, Institute of Marine Science, Contributions in Marine Science, vol. 17, p. 63-98.

One S. maculatus was caught in October 1965.

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, Tex., 327 p.

Identification key, morphological description, and range of S. cavalla, S. regalis, and S. maculatus.

Holder, C.F. 1913. The game fishes of the world. Hodder and Stoughton, London. 411 p.

This book includes a general account of recreational fishing for Spanish mackerel and king mackerel in the Gulf of Mexico.

Hubbs, C.L. 1936. Fishes of the Yucatan Peninsula, p. 157-287. In A.S. Pearse, E.P. Creaser, and F.G. Hall, The centoes of Yucatan. Carnegie Institution of Washington, Publication no. 457.

A description of two juvenile S. regalis is presented.

Hughes, G.M. 1966. The dimensions of fish gills in relation to their function. Journal of Experimental Biology, vol. 45, p. 177-195.

Data on Spanish mackerel, S. maculatus, are included.

Ingle, R.M. 1967. Purse net studies in Florida. Florida Board of Conservation, Special Scientific Report, no. 19, 15 p.

Studies conducted on the Gulf coast of Florida indicate that purse seines could be used effectively for a number of species, including king mackerel.

Irby, E.W., Jr. 1974. A fishing survey of Choctawhatchee Bay and adjacent Gulf of Mexico waters. Florida Marine Research Publication, no. 2, 26 p.

The catches included S. maculatus and S. cavalla.

Iversen, E.S., and N.N. Van Meter. 1967. A new myxosporidian (Sporozoa) infecting the Spanish mackerel. Bulletin of Marine Science, vol. 17, p. 268-273.

Kudoa crumena is reported for the musculature of S. maculatus.

Ivo, C.T.C. 1972. Época de desova e idade na primeira maturação sexual da cavala, Scomberomorus cavalla (Cuvier), no Estado do Ceará [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 12, no. 1, p. 27-29.

Information was based on 4,346 females collected from 1969 to 1971. Fork length and stage of sexual maturity were determined for each individual. The shortest mature female was III years in age, the longest VIII years.

Ivo, C.T.C. 1974. Sobre a fecundidade da cavala, Scomberomorus cavalla (Cuvier), em águas costeiras do Estado do Ceará (Brasil) [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 14, no. 2, p. 87-89.

Absolute fecundity by total length, by age, and by total weight is calculated for S. cavalla.

Jarvis, N.D. 1932. The fisheries of Puerto Rico. U.S. Bureau of Fisheries, Investigational Report, vol. 1, no. 13, 41 p.

S. cavalla and S. maculatus were caught by trolling.

Jenkins, O.P. 1887. A list of the fishes of Beaufort Harbor, N.C. Studies of the Biological Laboratory, John Hopkins University, vol. 4, no. 2, p. 83-94.

The list is composed of 57 families and 134 species of fishes. Spanish mackerel, S. maculatus, and cero, S. regalis, are included.

Jordan, D.S. 1884. List of fishes collected at Key West, Florida, with notes and descriptions. Proceedings of the U.S. National Museum, vol. 7, p. 103-150.

One hundred and seventy-one species were collected by the author with the aid of local fishermen. Color description, meristics, seasonal occurrence, and edibility of S. cavalla are included. S. maculatus is uncommon, and not highly esteemed by local fishermen. S. regalis is common and is described by color and several morphometrics.

Jordan, D.S. 1886a. List of fishes collected at Havana, Cuba, in December, 1883, with notes and descriptions. Proceedings of the U.S. National Museum, vol. 9, p. 31-55.

Fifty-four families with representative species are given. Included in the Family Scombridae are Spanish mackerel, S. maculatus, cero or "pintada," S. regalis, and king or "sierra serrucho," S. cavalla.

Jordan, D.S. 1886b. Notes on fishes collected at Beaufort, North Carolina, with a revised list of the species known from that locality. Proceedings of the U.S. National Museum, vol. 9, p. 25-30.

One hundred and fourteen species were collected by Oliver P. Jenkins, Indiana State Normal School, Terre Haute. Thirty-eight Spanish mackerel, S. maculatus Mitchill, were included.

Jordan, D.S. 1886c. A preliminary list of the fishes of the West Indies. Proceedings of the U.S. National Museum, vol. 9, p. 554-608.

S. regalis and S. cavalla are included in a list of 112 families and 875 species.

Jordan, D.S. 1887. A catalogue of the fishes known to inhabit the waters of North America, north of the Tropic of Cancer, with notes on the species discovered in 1883 and 1884. U.S. Commissioner of Fish and Fisheries, Report for 1885, part 13, p. 789-973.

The cero, S. regalis, king, S. cavalla, and Spanish mackerel, S. maculatus, are included in a list of 157 families and 1,683 species.

Jordan, D.S. 1905. A guide to the study of fishes. Henry Holt and Co., New York. 2 vols.

The schooling behavior and color description are given for the Spanish mackerel, S. maculatus. A color description is provided for S. regalis, and size and color for the king mackerel, S. cavalla.

Jordan, D.S. 1923. A classification of fishes including families and genera as far as known. Stanford University Publications, University Series, Biological Sciences, vol. 3, no. 2, p. 79-342.

Scomberomorus and Cybium are included in a list of families and genera.

Jordan, D.S. 1963. The genera of fishes; and, A classification of fishes. Stanford University Press, Stanford, Calif. 800 p.

A reprint of Jordan's Genera of Fishes (four parts, 1917-1920), together with its taxonomic index, A Classification of Fishes (1923). In the Genera of Fishes, reference is made to type Scomberomorus Plumieri "(Scomber regalis Bloch)". In a Classification of Fishes, the genus Scomberomorus is included under family Scombridae.

Jordan, D.S., and B.W. Evermann. 1896a. A check-list of the fishes and fish-like vertebrates of North and Middle America. U.S. Commissioner of Fish and Fisheries, Report for 1895, part 21, p. 209-584.

The ranges of S. maculatus, S. regalis, and S. cavalla are included, plus a brief synonymy listing.

Jordan, D.S., and B.W. Evermann. 1896b. The fishes of North and Middle America. U.S. National Museum, Bulletin no. 47, part 1, 1240 p.

Descriptions, distributions, and size are discussed for S. maculatus, S. regalis, and S. cavalla.

Jordan, D.S., and B.W. Evermann. 1903. American food and game fishes. Doubleday, Page and Company, New York. 572 p.

Keys and distributions are given for S. cavalla, S. maculatus, and S. regalis. Notes on the foods, reproduction, and commercial fishery are provided for the Spanish mackerel, and notes on the habitats and commercial fishery are included for the king mackerel.

Jordan, D.S., B.W. Evermann, and H.W. Clark. 1930. Check list of the fishes and fishlike vertebrates of North and Middle America north of the northern boundary of Venezuela and Columbia, with appendixes. U.S. Commissioner of Fisheries, Report for 1928, part 2, 670 p.

S. maculatus and S. regalis are listed with ranges and synonymies. Sierra cavalla is also listed. The common names of sierra, kingfish, and cavalla are given to Sierra cavalla.

Jordan, D.S., and C.H. Gilbert. 1878. Notes on the fishes of Beaufort Harbor, North Carolina. Proceedings of the U.S. National Museum, vol. 1, p. 365-388.

Cybium maculatum and C. regale are both listed as found at Beaufort Harbor, N.C.

Jordan, D.S., and C.H. Gilbert. 1882a. Notes on a collection of fishes from Charleston, South Carolina, with descriptions of three new species. Proceedings of the U.S. National Museum, vol. 5, p. 58-620.

Fish were collected in July and August, 1882. One hundred and twenty-three species of marine fish were observed including S. maculatus and S. caballa.

Jordan, D.S., and C.H. Gilbert. 1882b. Notes on fishes observed about Pensacola, Florida, and Galveston, Texas, with description of new species. Proceedings of the U.S. National Museum, vol. 5, p. 241-307.

The list includes Spanish mackerel and king mackerel with morphometrics, meristics, and color description of the latter.

Jordan, D.S., and C.H. Gilbert. 1882c. On certain neglected generic names of La Cépède. Proceedings of the U.S. National Museum, vol. 5, p. 570-576.

In the *Historie naturelle des poissons* (1799-1803) of Lacépède a considerable number of generic names are proposed, some of them founded on errors of various sorts, others properly defined. This paper contains a discussion of some of these names, the adoption of which would effect the nomenclature of American fishes. The name Scomberomorus, if accepted, must supercede Cybium Cuv. and Val.

Jordan, D.S., and C.H. Gilbert. 1882d. Synopsis of the fishes of North America. Bulletin of the U.S. National Museum, vol. 16, p. 425-427.

Fishes of North America are listed in phylogenetic order with meristic and color descriptions, and geographic distribution. Members of the genus Scomberomorus are included.

Jordan, D.S., and C.H. Gilbert. 1883. List of fishes collected at Panama by Charles H. Gilbert. Bulletin of the U.S. Fish Commission, vol. 2, p. 109-111.

S. maculatus is included in the list of fishes.

Jordan, D.S., and J.C. Thompson. 1905. The fish fauna of the Tortugas Archipelago. Bulletin of the U.S. Bureau of Fisheries, vol. 24, p. 229-256.

S. maculatus and S. cavalla are listed as occurring in the Tortugas Archipelago.

Jorgenson, S.C., and G.L. Miller. 1968. Length relations of some marine fishes from coastal Georgia. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 575, 16 p.

Length-weight relationship data are presented for S. maculatus.

Joseph, E.B., and R.W. Yerger. 1956. The fishes of Alligator Harbor, Florida, with notes on their natural history. Florida State University Studies, no. 22; and, Papers from the Oceanographic Institute, Florida State University, vol. 2, p. 111-156.

Six specimens of S. maculatus (69-230 mm) were collected between May 1950 and November 1954, in Alligator Harbor.

Juhl, R. 1974. Fishery resources--commercial, p. 211-225. In R.E. Smith (ed.), Proceedings of the Conference on Marine Environmental Implications of Offshore Drilling in Eastern Gulf of Mexico, 1974, St. Petersburg, Fla. Conference/Workshops.

S. cavalla and S. maculatus are listed as "underused, and latent resources."

Juhl, R. 1976. Notes on the underutilized fishery resources of the Gulf of Mexico, p. 538-555. In B.F. Cobb III and Alexandra B. Stockton (comp.), Proceedings of the First Annual Tropical and Subtropical Fisheries Technological Conference, vol. 2. Texas A&M University, College Station. (TAMU-SG-77-105.)

Both king and Spanish mackerels are important to commercial and recreational fisheries in the Gulf. Estimates of the mackerel population in the Gulf are from 100 to 140 million pounds.

Juneau, C.L., Jr. 1975. An inventory and study of the Vermilion Bay-Atchafalaya Bay complex. Phase II. Biology. Louisiana Wild Life and Fisheries Commission, Oysters, Water Bottoms and Seafoods Division, Technical Bulletin, no. 13, p. 19-74.

S. cavalla and S. maculatus were caught in trawl and seine.

Kawaguchi, K. 1974. Handline and longline fishing explorations for snapper and related species in the Caribbean and adjacent waters. Marine Fisheries Review, vol. 36, no. 9, p. 8-31.

S. maculatus is used as bait for longlines to catch other species.

Keiser, R.K., Jr. 1976. Species composition, magnitude and utilization of the incidental catch of the South Carolina shrimp fishery. South Carolina Marine Resources Center, Technical Report no. 16, 55 p.

King mackerel and Spanish mackerel were both sampled from shrimp trawl catches. S. maculatus was the more common species.

Kelley, J.R. 1965. A taxonomic survey of the fishes of Delta National Wildlife Refuge with emphasis upon distribution and abundance. M.S. thesis, Louisiana State University, Baton Rouge, 126 p.

One juvenile Spanish mackerel (2.3 inches) was taken in a rotenone sample from Sabot Pond, August 5, 1964. The salinity was 0.21 o/oo.

Kensley, B., and J. R. Grindley. 1973. South African parasitic Copepoda. Annuals of the South African Museum, vol. 62, no. 3, p. 69-130.

S. maculatus is included in a list of hosts for parasitic copepods. Pseudocycnoides rugosa n. sp. were identified on fish collected at Durban.

Kite, J.A. 1885. Report upon apparatus and facilities needed for hatching Spanish mackerel. U.S. Commissioner of Fish and Fisheries, Report for 1883, part 11, p. 1095-1100.

Apparatus is described for hatching eggs of the Spanish mackerel.

Klawe, W.L. 1961. Young scombroids from the waters between Cape Hatteras and Bahama Islands. Bulletin of Marine Science of the Gulf and Caribbean, vol. 11, no. 1, p. 150-157.

Four specimens (20-30 mm TL) were found in the stomachs of Euthynnus and were identified to the genus Scomberomorus

Klein, V.L.M. 1973. Parasite helminths of the species Scomberomorus cavalla and Scomberomorus maculatus of the Ceará littoral. Memórias do Instituto Oswaldo Cruz, vol. 70, no. 1-2, p. 199-202.

Parasitic worms were identified in king mackerel and Spanish mackerel off the State of Ceará, Brazil.

Klima, E.F. 1959. Aspects of the biology and the fishery for Spanish mackerel, Scomberomorus maculatus (Mitchill), of southern Florida. Florida Board of Conservation, Technical Series, no. 27, 39 p.

This paper includes taxonomic status, distribution, commercial and recreational fishery information, and results of life history aspects (foods, reproduction, age and growth, length-weight).

Klima, E.F. 1976. An assessment of the fish stocks and fisheries of the Campeche Bank. FAO, Western Central Atlantic Fishery Commission, WECAF Studies, no. 5, 24 p.

The author briefly mentions the commercial fishing gear, and then calculates yield/recruit models using other researchers' age and growth data.

Knapp, F.T. 1949. Menhaden utilization in relation to the conservation of food and game fishes of the Texas Gulf coast. Transactions of the American Fisheries Society, vol. 79, p. 137-144.

Menhaden as food for S. cavalla and S. maculatus is discussed.

Kner, R. 1865. Fische, p. 110-275. In B. von Wullerstorff-Urbair, Reise der Osterreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859. Zoologischer Theil, vol. 1, no. 5, pt. 2.

Color description, morphometrics, and meristics are given for Cybium regale.

Kohn, A. 1961. A new Rhipidocotyle parasite of Scomberomorus maculatus (Mitchill). Atas da Sociedade Biologia do Rio de Janeiro, vol. 5, no. 6, p. 41-44.

Rhipidocotyle quadriculatum is described from the small intestine of S. maculatus (= S. brasiliensis), in the vicinity of Angra dos Reis, Rio de Janeiro, Brazil.

Koratha, K.J. 1955a. Studies on the monogenetic trematodes of the Texas coast. I. Results of a survey of marine fishes at Port Aransas, with a review of Monogenea reported from the Gulf of Mexico and notes on euryhalinity, host-specificity, and relationship of the remora and the cobia. University of Texas, Institute of Marine Science, Publications, vol. 4, no. 1, p. 233-249.

Trematodes were identified in S. maculatus during the survey.

Koratha, K.J. 1955b. Studies on the monogenetic trematodes of the Texas coast. II. Descriptions of species from marine fishes of Port Aransas. University of Texas, Institute of Marine Science, Publications, vol. 4, no. 1, p. 251-278.

The following Monogenea were found in S. maculatus:
Microcotyle scomberomori, Pseudaxine texana, and
Heteraxine scomberomori.

Kruczynski, W.L. 1974. A review of the oceanography and fishery of Onslow Bay, North Carolina. North Carolina Department of Natural and Economic Resources, Division of Commercial and Sports Fisheries, Information Series, no. 6, 47 p.

Bluefish, Spanish mackerel, and king mackerel are mentioned as three of the most commonly caught species by recreational fishermen. The mackerels are caught mainly in spring and fall by trolling close to the shore, especially off Cape Lookout and Cape Fear.

Lacépède, C. 1802. Histoire naturelle des poissons, vol. 4. Chez Plassan, Imprimeur-Libraire, Paris. 728 p.

The author describes S. plumieri (synonymized with S. regalis in Rivas, 1951).

LaMonte, F. 1951. A preliminary survey of marine angling in North Carolina, p. 251-286. In H.F. Taylor (ed.), Survey of marine fisheries of North Carolina. University of North Carolina Press, Chapel Hill.

The fishing methods, size, and distribution are provided for S. cavalla. Associations with schools of S. regalis and S. maculatus are discussed.

LaMonte, F. 1952a. Marine game fishes of the world. Doubleday and Co., New York. 190 p.

Color descriptions, distinguishing characteristics, range, size, foods, schooling behavior, and commercial and recreational fisheries notes are provided for the king, Spanish, and cero mackerels. A Spanish mackerel is illustrated in color.

LaMonte, F. 1952b. North American game fishes. Doubleday and Co., New York. 202 p.

S. maculatus, S. cavalla, and S. regalis are all mentioned in this anglers' guide. The common names, characteristics, color, and distribution are provided for S. regalis, and distribution, color, size, foods, schooling, and behavior are mentioned for both the Spanish and king mackerel.

Latham, R. 1918. Notes on fishes at Orient, Long Island, in 1917. Copeia, no. 57, p. 53-56.

One S. regalis was taken on October 2, 26 inches in total length, and another September 23, 26 inches in length, both from the Sound.

Latham, R. 1919. Record of fishes at Orient, Long Island, in 1918. Copeia, no. 71, p. 53-60.

On September 21, two specimens of S. cavalla were caught, one 32 inches in length and $6 \frac{1}{2}$ pounds and the other 30 inches. Another fish was taken on September 23, and was 30 inches in length. This is the first record of its occurrence in twelve years. It rarely lives longer than 10 hours confined in a trap.

Lee, P.C., J.R. Fisher, and P.F. Mar. 1973. Immunochemical studies of adenosine deaminases from several vertebrates and a mollusc. Comparative Biochemistry and Physiology, vol. 46B, no. 3, p. 483-486.

Cross-reactivities of adenosine deaminases from nine mammals and one marsupial, bird, amphibian, fish (king mackerel), and mollusc were measured. Antisera were prepared against the purified enzyme from bovine intestine and scallop digestive diverticula.

Leim, A.H., and W.B. Scott. 1966. Fishes of the Atlantic coast of Canada. Fisheries Research Board of Canada, Bulletin, no. 155. 485 p.

The authors compare the space between the dorsal fins of Auxis thazard with other scombrids, including S. maculatus.

Léon, P.E. 1973. Ecología de la ictiofauna del Golfo de Nicoya, Costa Rica, un estuario tropical. Revista de Biología Tropical, vol. 21, no. 1, p. 5-30.

The Spanish mackerel, S. maculatus, is included in a list of 145 species of fish collected from the Gulf of Nicoya, Costa Rica, Jan. 1968 to Mar. 1969.

Lima, H.H., and M.P. Paiva. 1966. Alguns dados ecológicos sobre os peixes marinhos de Aracati. Boletim da Estação de Biologia Marinha da Universidade Federal do Ceará, no. 11, 10 p.

The collection of fishes in terms of distance from land is discussed. King mackerel were abundant 6-15 miles offshore, depths 16-36 meters; Spanish mackerel (= S. brasiliensis) were abundant 3-15 miles from land, depths of 10-36 meters.

Lindall, W.H., Jr. 1973. Alterations of estuaries of South Florida: A threat to its fish resources. Marine Fisheries Review, vol. 35, no. 10, p. 26-33.

S. maculatus is listed as a major estuarine-dependent fish. Landings and values are given for 1966-70.

Linton, E. 1897. Notes on larval cestode parasites of fishes. Proceeding of the U.S. National Museum, vol. 19, no. 1123, p. 787-824.

The parasites identified include Rhynchobothrium, sp., Tetrarhynchus, sp., and T. bicolor on S. regalis and Synbothrium filicolle on S. cavalla, and S. maculatus.

Linton, E. 1901a. Fish parasites collected at Woods Hole in 1898. Bulletin of the U.S. Fish Commission for 1899, vol. 19, p. 267-304.

S. regalis is referred to as Spanish mackerel. One specimen was examined and a cestode (Synbothrium) was found.

Linton, E. 1901b. Parasites of fishes of the Woods Hole Region. Bulletin of the U.S. Fish Commission for 1899, vol. 19, p. 405-492.

Nematodes, cestodes, and trematodes were found in S. maculatus; cestodes were found in S. cavalla and S. regalis. Notes on food found in stomachs of king mackerel and cero are included.

Linton, E. 1905. Parasites of fishes of Beaufort, North Carolina. Bulletin of the U.S. Bureau of Fisheries for 1904, vol. 24, p. 321-428.

Cestodes and trematodes were found in S. maculatus, and nematodes, cestodes, and trematodes in S. regalis.

Linton, E. 1907. A cestode parasite in the flesh of the butterfish. Bulletin of the U.S. Bureau of Fisheries for 1906, vol. 26, p. 111-132.

S. regalis is listed as a host for cestodes.

Linton, E. 1940. Trematodes from fishes mainly from the Woods Hole region, Massachusetts. Proceedings of the U.S. National Museum, vol. 88, no. 3078, 172 p.

Nannoenterum baculum (Linton) is identified on S. maculatus.

Lom, J. 1970. Protozoa causing diseases in marine fishes, p. 101-123. In S.F. Snieszko (ed.), A symposium on diseases of fishes and shellfishes. American Fisheries Society, Special Publication, no. 5.

A protozoan cyst was found in the musculature of S. maculatus.

Longley, W.H., and S.F. Hildebrand. 1941. Systematic catalogue of the fishes of Tortugas, Florida, with observations on color, habits, and local distribution. Carnegie Institution of Washington, Publication 535. 331 p.

Comments are presented on the color, distribution and habits of S. cavalla, S. regalis, and S. maculatus in Tortugas.

López, M.L., and T. Okuda. 1965. Notas sobre el estado de frescura de algunos pescados [in Spanish, English summary]. Boletín del Instituto Oceanográfico de la Universidad de Oriente, vol. 4, no. 2, p. 312-337.

Spanish mackerel, S. maculatus, was one of the species of fish used to test various storage temperatures and effects on fish flesh.

Lopez, O.H. 1972. Algunos aspectos de las pesquerías marítimas en la zona central de Venezuela [in Spanish, English summary]. Proyecto de Investigación y Desarrollo Pesquero, MAC-PNUD-FAO, Caracas, Informe Técnico, no. 48, 38 p.

The author describes the fishing fleet, gear, number of people involved, and production. Species caught include S. cavalla and S. maculatus (= S. brasiliensis).

Lowe, R.H. 1963. The fishes of the British Guiana continental shelf, Atlantic coast of South America, with notes on their natural history. Journal of the Linnean Society of London, Zoology, vol. 44, no. 301, p. 669-700.

This article describes the habitat of S. maculatus (= S. brasiliensis) and S. cavalla by depth, distance from shore, and bottom type. The gonad condition of S. maculatus by month, and general comments on the foods of both S. maculatus and S. cavalla are presented.

Lozano Cabo, F. 1950. Estudio de la fauna ictiológica de los bancos de cabo Blanco y de Arguín, como transitoria entre la paleártica y la tropical. Boletín de la Real Sociedad Española de Historia Natural, Sección Biológica, vol. 48, no. 2, p. 137-150.

S. maculatus is included in a list of fishes.

Lozano Cabo, F. 1970. Caractéristiques zoogéographiques de la faune ichthyologique des côtes des Iles Canaries, du Maroc, du Sahara Espagnol et de la Mauritanie avec une étude spéciale des poissons côtiers. Rapports et Procès-Verbaux des Reunions, Conseil Permanent International pour l'Exploration de la Mer, no. 159, p. 152-164.

A table includes S. maculatus as occurring off the West Coast of Africa.

Lunz, G.R., and F.J. Schwartz. 1970. Analysis of eighteen year trawl captures of seatrout (Cynoscion sp.:Sciaenidae) from South Carolina. Bears Bluff Laboratories, Contribution, no. 53, p. 3-29.

S. maculatus collected by subarea is included.

Lyles, C.H. 1969. The Spanish mackerel and king mackerel fisheries. U.S. Fish and Wildlife Service, C.F.S., no. 4936, 21 p.

Distribution, color, school size, size, commercial landings, and history of the fishery are given for S. maculatus. The fishery and range for S. regalis, and recipes for both species are included.

McFarland, W.N. 1963. Seasonal change in the number and the biomass of fishes from the surf at Mustang Island, Texas. University of Texas, Institute of Marine Science, Publications, vol. 9, p. 91-105.

Dates of capture and weight (pounds per acre) for S. maculatus are given. S. maculatus is regarded as a summer resident.

McHugh, J.L. 1967. Estuarine nekton, p. 581-620. In G.H. Lauff (ed.), Estuaries. American Association for the Advancement of Science, Publication, no. 83.

S. maculatus were caught by trawling in Chesapeake Bay. S. cavalla were mentioned as occasional nektonic visitors in the Bay.

McHugh, J.L. 1975. Limiting factors affecting commercial fisheries in the middle Atlantic estuarine area, p. 149-169. In Estuarine pollution control and assessment, vol. 1. U.S. Environmental Protection Agency, Office of Water Planning and Standards, Washington, D.C.

The Spanish mackerel is listed as an "oceanic migratory" species and one of the important fishes landed by the domestic commercial fishery in the Middle Atlantic estuarine area (Chesapeake Bay), 1969-1973.

McHugh, J.L. 1977. Fisheries and fishery resources of the New York Bight. U.S. National Marine Fisheries Service, Circular 401, 50 p.

Maximum historic commercial landings are given for various species of fish and shellfish for New Jersey and New York. Both Spanish mackerel and king mackerel are included.

McHugh, J.L., and A.D. Williams. 1976. Historical statistics of the fisheries of the New York Bight area. New York Sea Grant Institute, State University of New York, NYSSGP-RS-76-013; also, State University of New York at Stony Brook, Marine Sciences Research Center, Contribution 164, 75 p.

Commercial landings (metric tons) of cero, Spanish mackerel, and king mackerel are included in the data for 1880 to 1975.

Magnuson, J.J. 1973. Comparative study of adaptations for continuous swimming and hydrostatic equilibrium of scombroid and xiphoid fishes. U.S. National Marine Fisheries Service, Fishery Bulletin, vol. 71, no. 2, p. 337-356.

S. maculatus, S. regalis, and S. cavalla are listed in a table. Data on mass, FL, presence or absence of gas bladder, long or short pectoral fins, and references are given.

Mago Leccia, F. 1958. The comparative osteology of the scombroid fishes of the genus Scomberomorus from Florida. Bulletin of Marine Science of the Gulf and Caribbean, vol. 8, p. 299-341.

Three species are compared: S. maculatus, S. regalis, and S. cavalla. Relationships are discussed within the genus and with other scombrid genera.

Mago Leccia, F. 1970. Lista de los peces de Venezuela, incluyendo un estudio preliminar sobre la ictiogeografía del país. Ministerio de Agricultura y Cria, Oficina Nacional de Pesca, Caracas. 283 p.

The king mackerel, Spanish mackerel (= S. brasiliensis), and cero are included in the list of fishes with the local common names of each species.

Mahood, R.K., C.D. Harris, J.L. Music, Jr., and B.A. Palmer. 1974a. Survey of the fisheries resources in Georgia's estuarine and inshore ocean waters. Part I. Southern section, St. Andrews Sound and St. Simons Sound Estuaries. Georgia Department of Natural Resources, Game and Fish Division, Contribution Series, no. 22, 104 p.

S. cavalla and S. maculatus were recorded in the trawl catches.

Mahood, R.K., C.D. Harris, J.L. Music, Jr., and B.A. Palmer. 1974b. Survey of the fisheries resources in Georgia's estuarine and inshore ocean waters. Part II. Central section, Doboy Sound and Sapelo Sound Estuaries. Georgia Department of Natural Resources, Game and Fish Division, Contribution series, no. 23, 99 p.

S. cavalla and S. maculatus were included in trawl catches.

Mahood, R.K., C.D. Harris, J.L. Music, Jr., and B.A. Palmer. 1974c. Survey of the fisheries resources in Georgia's estuarine and inshore ocean waters. Part III. Northern section, Ossabow Sound and Wassaw Sound Estuaries. Georgia Department of Natural Resources, Game and Fish Division, Contribution Series, no. 24, 100 p.

S. cavalla and S. maculatus were included in trawl catches.

Mahood, R.K., C.D. Harris, J.L. Music, Jr., and B.A. Palmer. 1974d. Survey of the fisheries resources in Georgia's estuarine and inshore ocean waters. Part IV. Coastal Georgia, southern, central, and northern sections. Georgia Department of Natural Resources, Game and Fish Division, Contribution Series, no. 25, 201 p.

S. cavalla and S. maculatus were included in comparisons by area of trawl catches and of distribution and abundance by area and season.

Manter, H.W. 1940. Gasterostomes (Trematoda) of Tortugas, Florida. Carnegie Institution of Washington, Papers from the Tortugas Laboratory, vol. 33, p. 1-19.

S. regalis was found to be a host of Rhipidocotyle adbaculum. The parasite was found in the intestine of one of the three fish examined. Rhipidocotyle baculum was also found in S. regalis. There was some question of the identity of the host and it is probably S. maculatus.

Manter, H.W. 1947. The digenetic trematodes of marine fishes of Tortugas, Florida. *American Midland Naturalist*, vol. 38, no. 2, p. 257-416.

S. regalis is the host for Rhipidocotyle adbaculum and R. baculum.

Manter, H.W. 1954. Trematoda of the Gulf of Mexico, p. 335-350. In Paul S. Galtsoff (Coordinator), *Gulf of Mexico, its origin, waters, and marine life*. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 55, no. 89.

S. regalis is listed as a host.

Márquez, M.R. 1973. Informe sinóptico de la sierra, Scomberomorus maculatus (Mitchill), de Golfo de México [in Spanish, English summary]. Instituto Nacional de Pesca (Mexico), Serie Informativa, no. 14, 19 p.

Synoptic information is provided on the taxonomy, nomenclature, geographical distribution, bionomics, life cycle, spawning, nutrition, growth, age and age determination by reading otolith, and population structure of the Spanish mackerel, S. maculatus, in the Gulf of Mexico. Information is also provided on the fishing methods, fishery areas and seasons, and annual yields from 1965 to 1972.

Martin, F.D., and J.W. Patus. 1974. A comparison of fish faunas in a highly stressed and a less stressed tropical bay, Guayanilla and Jobos Bay, Puerto Rico. *Proceedings of the Southeastern Association of Game and Fish Commissioners*, 27th Annual Conference, 1973, p. 675-688.

The king mackerel, Spanish mackerel, and cero were all collected from Jobos Bay, and the cero was taken from Guayanilla Bay, Puerto Rico.

Martins, J.M., and M.S. Pitombeira. 1968. High leukocyte count in fishes. *Revista Brasileira de Pesquisas Medicas e Biologicas*, vol. 1, no. 2, p. 89-92.

An abnormal leukocyte count is recorded for S. maculatus (= S. brasiliensis).

Massmann, W.H. 1960. Additional records for new fishes in Chesapeake Bay. *Copeia*, 1960, no. 1, p. 70.

The occurrence of S. cavalla is confirmed for the Chesapeake Bay.

Massmann, W.H. 1962. Water temperatures, salinities, and fishes collected during trawl surveys of Chesapeake Bay and York and Pamunkey Rivers, 1956-1959. Virginia Institute of Marine Science, Special Scientific Report, no. 27, 27 p.

S. maculatus was caught in the Bay in fall.

Mather, F.J., III. 1952. Sport fishes of the vicinity of the Gulf of Honduras, certain Caribbean islands, and Carmen, Mexico. *Proceedings of the Gulf and Caribbean Fisheries Institute, 4th Annual Session, 1951*, p. 118-129.

S. regalis, S. cavalla, and S. maculatus are included.

Mather, F.J., III. 1954. Northerly occurrences of warmwater fishes in the western Atlantic. *Copeia*, 1954, no. 4, p. 292-293.

S. cavalla is reported from Massachusetts.

Mather, F.J., III, and C.G. Day. 1954. Observations of pelagic fishes of the tropical Atlantic. *Copeia*, 1954, no. 3, p. 178-188.

Catches of single specimens of S. maculatus and S. cavalla are mentioned. The morphometry of S. maculatus from the eastern Atlantic and western Atlantic is compared.

er, F.J., III, and R.H. Gibbs, Jr. 1957. Distributional records of fishes from waters off New England and the middle Atlantic states. *Copeia*, 1957, no. 3, p. 242-244.

S. cavalla is reported from Buzzards Bay, Mass.

sumura, F., Y.G. Doherty, K. Furukawa, and G.M. Boush. 1975. Incorporation of ^{203}Hg into methylmercury in fish liver: Studies on biochemical mechanisms in vitro. *Environmental Research*, vol. 10, no. 2, p. 224-235.

Livers of all fish species studied, particularly pelagic species (including S. maculatus and S. cavalla), were capable of transforming mercuric ion into methylmercury in vitro. The factors involved in the process of methylmercury formation from Hg^{2+} ion in the fish liver were studied.

, N., L. Trent, and P.J. Pristas. 1976. Relation of fish catches in gill nets to frontal periods. U.S. National Marine Fisheries Service, Fishery Bulletin, vol. 74, no. 2, p. 449-453.

S. maculatus is among the 10 most caught fishes. High catches of S. maculatus were not correlated with occurrences of atmospheric fronts.

o, C.A. 1973. Rearing, growth, and development of the eggs and larvae of seven scombrid fishes from the Straits of Florida. Ph.D. Thesis, University of Miami, 138 p. Dissertation Abstracts International, B: Sciences and Engineering, vol. 34, no. 4, p. 2145.

Methods used in rearing seven species of mackerels and tunas (family Scombridae) are presented. The growth, behavior, ecology, and development of the eggs and larvae of S. cavalla and S. maculatus are included.

Meek, S.E., and S.F. Hildebrand. 1923. The marine fishes of Panama. Field Museum of Natural History, Zoological Series, no. 15, Publication, no. 215, 330 p.

The writer made collections at several points along both coasts of Panama during two seasons, from January to May 1911 and from January and March 1912. S. cavalla was included in the list although it has not been reported from Panama and was not collected by the authors. Meristics, morphometrics, color description, and geographical range are discussed. S. regalis was not recorded from Panama although meristics, morphometrics, color, and geographical distribution are presented. S. maculatus (= S. brasiliensis) was collected from Panama and from both coasts according to the authors. The same type of data is provided as for the above species.

Meek, S.E., and R.G. Newland. 1885. A review of the American species of Scomberomorus. Proceedings of the Academy of Natural Sciences of Philadelphia, 1884 (1885), p. 232-235.

Taxonomic key and synonyms are given for S. maculatus, S. regalis, and S. cavalla.

Mendoza, N.A. 1968. Consideraciones sobre la biología pesquera de la sierra, Scomberomorus maculatus (Mitchill), en el Estado de Veracruz. Bios, vol. 1, no. 2, p. 11-22.

Seasonal occurrence, migratory habits, and notes on the general biology of Spanish mackerel off the Mexican east coast.

Menezes, M.F. 1968. Aspectos da pesca artesanal de algumas espécies marinhas no Estado do Ceará [in Portuguese, English summary]. Boletim da Estação de Biologia Marinha da Univeridade Federal do Ceará, no. 17, 11 p.

Fisheries in the state of Ceará, Brazil, including S. cavalla and S. maculatus (= S. brasiliensis), are described.

Menezes, M.F. 1969a. Algumas observações osteológicas e merísticas sobre a cavala, Scomberomorus cavalla (Cuvier), do noroeste Brasileiro [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 9, no. 2, p. 175-178.

Osteological and meristic differences of S. cavalla from the northeast Brazil and Atlantic coasts of the U.S., including the Caribbean Sea, are described. Cranial bones from Brazil are more elongate. Parasphenoid and hypobranchial present differences. "The parasphenoid bone permits clear vision, on a second plane, of the brain chamber opening and the hypobranchial presents a single gill raker, or none at all. These characteristics are not found in the Gulf of Mexico and Caribbean Sea."

Menezes, M.F. 1969b. Alimentação da cavala, Scomberomorus cavalla (Cuvier), em águas costeiras do Estado do Ceará [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 9, no. 1, p. 15-20.

Feeding behavior of 798 S. cavalla was examined from 1965 to 1968. Fishes are the most important food item; crustaceans and mollusks are second. Opisthonema oglinum is the most important food. Appetite declined in the 4th quarter at the time of the beginning of the reproductive cycle. Females were more voracious than males, and thus show greater intensity in growth and in longevity.

Menezes, M.F. 1970. Alimentação da serra, Scomberomorus maculatus (Mitchill), em águas costeiras do Estado do Ceará [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 10, no. 2, p. 171-176.

One thousand and twenty S. maculatus (= S. brasiliensis), were sampled, 117 young and 903 adults. Fishes were most important in their diet, decapod crustaceans and cephalopods second. Opisthonema oglinum was most abundant with engraulids next.

Menezes, M.F. 1972. Número de rastros da serra, Scomberomorus maculatus (Mitchill), das águas costeiras do Estado do Ceará [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 12, no. 1, p. 86-88.

Gill rakers of the Spanish mackerel (= S. brasiliensis) were counted and some comparisons were made with data from other regions of its geographic distribution.

Menzel, R.W. 1956. Annotated check-list of the marine fauna and flora of the St. George's Sound-Apalachee Bay region, Florida gulf coast. Florida State University, Oceanographic Institute, Contribution, no. 61.

S. cavalla and S. maculatus were identified by Edwin B. Joseph in the St. George's Sound and Apalachee Bay Region.

Migdalski, E.C. 1958. Anglers' guide to the salt water game fishes. Ronald Press Company, New York. 506 p.

King, Spanish, and cero mackerels are discussed, with emphasis on recreational angling. Some information is provided on meristics, color characteristics, schooling behavior, and migration patterns.

Mihara, T., A. Brito, J. Ramirez, and J.V. Salazar. 1971. Construcción de una red de barrera para Uquire [in Spanish, English summary]. Proyecto de Investigación y Desarrollo Pesquero, MAC-PUND-FAO, Caracas, Informe Técnico, no. 22, 15 p.

Uquire is a small village on the north coast of Paria Peninsula near Trinidad. Seines are used to catch sardines as bait for S. cavalla.

Miller, G.L., and S.C. Jorgenson. 1969. Seasonal abundance and length frequency distribution of some marine fishes in coastal Georgia. U.S. Fish and Wildlife Service, Data Report, no. 35, 102 p.

Data are presented for 101 species of fish collected from March 1953 to May 1961, on the ocean beach and in salt marshes in coastal Georgia. Sixty-nine juvenile S. maculatus (most 16-25 mm) were collected from the beach, May-September. One S. cavalla was also collected.

Mitchill, S.L. 1815. The fishes of New York, described and arranged. Transactions of the Literary and Philosophical Society of New-York, vol. 1, p. 355-492.

The original description of the Spanish mackerel, Scomber maculatus. Color descriptions and meristics are given and the occurrence of the species in July is noted.

Miyake, M., and S. Hayasi. 1972. Field manual for statistics and sampling of Atlantic tunas and tuna-like fishes. International Commission for the Conservation of Atlantic Tunas, Madrid, Spain.

A taxonomic key is provided for S. cavalla, S. maculatus, S. regalis, and S. tritor. S. tritor (eastern Atlantic) is separated from S. maculatus (western Atlantic) by the number of vertebrae. Standard and common names are also included for each species.

Moe, M.A., Jr. 1963. A survey of offshore fishing in Florida. Florida State Board of Conservation, Marine Laboratory, Professional Paper Series, no. 4, 115 p.

The importance of S. cavalla, S. maculatus, and S. regalis in fisheries, and their biology is discussed.

Moe, M.A., Jr. 1966. Tagging fishes in Florida offshore waters. Florida Board of Conservation, Marine Laboratory, Technical Series, no. 49, 40 p.

Tagging gear, methods and techniques, and recoveries are discussed for S. cavalla.

Moe, M.A., Jr. 1970. Florida's fishing grounds. Great Outdoors Publishing Co., St. Petersburg, Fla. 80 p.

Common names, distribution, description, fishing methods, and notes on S. cavalla, S. maculatus, and S. regalis are given.

Moe, M.A., Jr. 1972. Movement and migration of south Florida fishes. Florida Department of Natural Resources, Marine Laboratory, Technical Series, no. 69, 25 p.

Comments are made on movements and spawning of S. cavalla and S. maculatus.

Moe, M.A., Jr., P.C. Heemstra, J.E. Tyler, and H. Wahlquist. 1966. An annotated listing of the fish reference collection of the Florida Board of Conservation Marine Laboratory. Florida Board of Conservation, Marine Laboratory, Special Scientific Report, no. 10, 121 p.

Catalog number, locality and dates are given for S. cavalla, S. maculatus, and S. regalis.

Mountain, J.A. 1972. Further thermal addition studies at Crystal River, Florida with an annotated checklist of marine fishes collected, 1969-1971. Florida Department of Natural Resources, Professional Papers Series, no. 20, 103 p.

Hydrographic and biological data collected during the first six months of 1971 are presented. These, plus 1969 and 1970 data, complete an ecological survey of estuarine and coastal areas near Florida Power Corporation's Crystal River steam electric generating station. S. maculatus is referred to. Two were collected in May 1969, one in April 1970, and two in January 1971. These fish ranged in size from 240 to 470 mm.



Nahhas, F.M., and R.M. Cable. 1964. Digenetic and aspidogastrid trematodes from marine fishes of Curaçao and Jamaica. *Tulane Studies in Zoology*, vol. 11, no. 5, p. 169-228.

S. cavalla from Curaçao and Jamaica is listed as a host.

Nahhas, F.M., and R.B. Short. 1965. Digenetic trematodes of marine fishes from Apalachee Bay, Gulf of Mexico. *Tulane Studies in Zoology*, vol. 12, no. 2, p. 39-50.

S. maculatus is listed as a host for digenetic trematodes.

Nakamura, E.L. 1976. Scombrid fishes in St. Andrew Bay, Florida. *Bulletin of Marine Science*, vol. 26, no. 4, p. 619-621.

Juveniles of six species of scombrids are reported, including two king mackerel, S. cavalla, and three Spanish mackerel, S. maculatus.

Nakamura, E.L., and L.R. Rivas. 1974. An analysis of the sportfishery for billfishes in the northeastern Gulf of Mexico during 1971. U.S. National Marine Fisheries Service, Special Scientific Report--Fisheries, no. 675, part 2, p. 269-289.

Sailfish often are caught while trolling for S. cavalla and S. maculatus.

Nakamura, E.L., and H.S.H. Yuen. 1961. Incidence of the giant trematode, Hirudinella marina Garcin, in skipjack tuna, Euthynnus pelamis (Linnaeus), from Marquesan and Hawaiian waters. *Transactions of the American Fisheries Society*, vol. 90, no. 4, p. 419-423.

S. maculatus is one of the hosts of the giant trematode, according to Nigrelli and Stunkard (1947).

Muir, B.S. 1969. Gill dimensions as a function of fish size.
Journal of the Fisheries Research Board of Canada, vol. 26,
no. 1, p. 165-170.

The author refers to data provided by Gray (1954) and
Hughes (1966) on the gill dimensions of S. maculatus.

Nahas, F.M., and R.M. Cable. 1964. Digenetic and aspidogastrid trematodes from marine fishes of Curaçao and Jamaica. *Tulane Studies in Zoology*, vol. 11, no. 5, p. 169-228.

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S. maculatus is one of the hosts of the giant trematode, according to Nigrelli and Stunkard (1947).

Navarro, F.P. 1943. La pesca de arrastre en los dondos del Cabo Blanco y del Banco Arquin (Africa Sahariana). Trabajos del Instituto Español de Oceanografía, no. 18, 225 p.

The "carita" (S. maculatus) is one of the species caught off the west coast of Africa. Relative abundance, gear, depth, bottom type, temperature, sex, gonad maturity stage, and synonyms are provided.

Nelson, J.S. 1976. Fishes of the world. John Wiley and Son, New York. 416 p.

Five genera, Scomber, Rastrelliger, Scomberomorus, Grammatorcynus, and Acanthocybium, with up to 24 species, are included under the tribe Scombrini.

Nichols, J.T. 1912. Notes on Cuban fishes. II. Market and other fishes, including two new species, observed in 1912. Bulletin of the American Museum of Natural History, vol. 31, no. 18, p. 180-194.

One hundred and eleven species are listed including S. regalis and S. cavalla. S. cavalla was held in high esteem by fishermen, while S. regalis was not.

Nichols, J.T. 1929. The fishes of Porto Rico and the Virgin Islands, Branchiostomidae to Sciaenidae. New York Academy of Sciences, Scientific Survey of Porto Rico and the Virgin Islands, vol. 10, no. 2, p. 161-295.

Synonymies, distributions, diagnoses, and remarks on S. maculatus, S. regalis, and S. cavalla are given.

Nichols, J.T., and C.M. Breder, Jr. 1927. The marine fishes of New York and southern New England. Zoologica (New York), vol. 9, no. 1, p. 1-192.

A taxonomic key, distributions, and life history aspects for Spanish mackerel, king mackerel, and cero are provided.

Nigrelli, R.R., and H. Stunkard. 1947. Studies on the genus Hirudinella, giant trematodes of scombriform fishes. Zoologica vol. 31, no. 4, p. 185-196.

A table is presented identifying S. maculatus collected off Port au Prince Bay, Haiti, as a host for Hirudinella. This fish is probably S. regalis.

Nomura, H. 1967. Dados biológicos sobre a serra, Scomberomorus maculatus (Mitchill), das águas Cearenses [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 7, no. 1, p. 29-39.

Condition factor by size, growth rings in otoliths, age groups, length-weight relations, and growth curves are given for S. maculatus (= S. brasiliensis).

Nomura, H., and R.S. Costa. 1966. Sobre o comprimento e o pêso da cavala e da serra das águas Cearenses [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 6, no. 1, p. 11-13.

The length-weight relationship of 666 king mackerel, S. cavalla, and 381 Spanish mackerel, S. maculatus (= S. brasiliensis), two important species from the coast of Ceará (Brazil) are discussed.

Nomura, H., and R.S. Costa. 1968. Length-weight relationship of two species of Scombridae fishes from northeastern Brazil. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 8, no. 1, p. 95-99.

Length-weight regressions by sexes for S. cavalla and S. maculatus (= S. brasiliensis) are given. The range in length is 42.5-123.5 cm FL for S. cavalla and 36.5-75.5 cm FL for S. maculatus.

Nomura, H., and M.S.S. Rodrigues. 1967. Biological notes on king mackerel, Scomberomorus cavalla (Cuvier), from north-eastern Brazil. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 7, no. 1, p. 79-85.

Condition factor, age and growth, and growth curves by sex are presented for S. cavalla.

Oliveira, A.M.E. 1974. Ictiofauna das águas estuarinas do Rio Parnaíba (Brasil) [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 14, no. 1, p. 41-45.

Ichthyofauna of estuarine waters of the Parnaíba River includes S. maculatus (= S. brasiliensis).

Osorio, B. 1898. Da distribuição geographica dos peixes e crustaceos colhidos nas possessões Portuguezas d'Africa Occidental e existentes no Museu Nacional de Lisboa. Journal de Sciencias Mathematicas, Physicas, e Naturaes, Lisboa, segundo serie, vol. 5, no. 19, p. 185-202.

Cybium maculatum is included in a list of fishes collected from the west coast of Africa.

Overstreet, R.M. 1969. Digenetic trematodes of marine teleost fishes from Biscayne Bay, Florida. Tulane Studies in Zoology and Botany, vol. 15, no. 4, p. 119-176.

S. maculatus and S. regalis are listed as hosts for digenetic trematodes.

Page, W.F. 1890. The most recent methods of hatching fish eggs. Bulletin of the U.S. Fish Commission for 1888, vol. 8, p. 207-218.

According to Earll (1883) there are 1,267,728 S. maculatus eggs to a standard quart, 57.75 cu. in., determined from egg diameter.

Paiva, M.P. 1966. Dados sôbre a pesca artesanal no Ceará em 1965 [in Portuguese, English summary]. Boletim da Estação de Biologia Marinha da Universidade Federal do Ceará, no. 12. 46 p.

Fishery data are given for several species, of which S. cavalla was the most important. Annual landings by gear, species, and locality are included.

Paiva, M.P. 1968. Sôbre os recursos pesqueiros do Estado do Ceará. Comision Asesora Regional de Pesca para el Atlantico Sudoccidental, Rio de Janeiro, Documentos Tecnicos, no. 27, 9 p.

Production and fishing methods employed off the coast of Ceará, Brazil are discussed. Annual tonnage and monetary values are compared with other Brazilian states. Spanish mackerel (= S. brasiliensis) and king mackerel are included.

Paiva, M.P., R.C.F. Bezerra, and A.A. Fonteles, Filho. 1971. Tentativa de avaliação dos recursos pesqueiros do nordeste Brasileiro [in Portuguese, English summary]. Arquivos de Ciências do Mar, vol. 11, no. 1, p. 1-43.

The fishery resource potential of northeast Brazil, including S. cavalla and S. maculatus (= S. brasiliensis) is assessed.

Paiva, M.P., and F. Cervigon. 1971. Los recursos pesqueros del nordeste de Sudamerica, p. 229-235. In Symposium on the investigations and resources of the Caribbean Sea and adjacent region. FAO Fisheries Report, no. 71.2.

S. cavalla and S. maculatus (= S. brasiliensis) in northeast Brazil and in the Guianas are mentioned.

Paiva, M.P., and R.S. Costa. 1966. Considerações sobre a produção de pescado marinho salgado no Estado do Ceará [in Portuguese, English summary]. Boletim da Estação de Biologia Marinha da Universidade Federal do Ceará, no. 15, 11 p.

Production of salted marine fish in Ceará, Brazil, 1961-1965, is reported. S. cavalla, S. regalis, and S. maculatus (= S. brasiliensis) were salted for market.

Paiva, M.P., and A.A. Fonteles, Filho. 1968. Sobre a produção pesqueira de alguns currais-de-pesca do Ceará - dados de 1965 a 1967 [in Portuguese, English summary]. Boletim da Estação de Biologia Marinha da Universidade Federal do Ceará, no. 16, 8 p.

Yield of wooden fish weirs in Ceará, Brazil, in 1965 to 1967, is given. S. maculatus (= S. brasiliensis) is included in the catches.

Paiva, M.P., and H.H. Lima. 1963. Segunda contribuição ao inventário dos peixes marinhos do nordeste Brasileiro [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 3, no. 1, p. 1-16.

S. maculatus (= S. brasiliensis) is included in an inventory of sea fishes of northeastern Brazil.

Paiva, M.P., and H.H. Lima. 1966. Terceira contribuição ao inventário dos peixes marinhos do nordeste Brasileiro [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 6, no. 1, p. 71-87.

Sea fishes of northeastern Brazil, including S. cavalla, are inventoried.

Paiva, M.P., and M.F. Menezes. 1967. Fish listed at the Dragão do Mar refrigerator warehouse during 1966. Boletim da Sociedade Cearense de Agronomia, no. 8, p. 67-73.

The fish catch during the year 1966 by the Brazilian Federal Government Fish Market, located at Mucuripe Beach (Fortaleza - Ceará - Brazil), is analysed. The main fish categories of economic importance, excluding miscellaneous, are red snapper, king mackerel, grouper and shark.

Paiva, M.P., and M.I. Mota. 1961. Atividades do "Albacora" em 1960 [in Portuguese, English summary]. Boletim da Estação de Biologia Marinha da Universidade Federal do Ceará, no. 4. 18 p.

The fishery for tunas and tuna-like fishes is from small wooden tuna boats. The fish are eviscerated before landing. Species caught include genus Scomberomorus.

Paiva, M.P., and E.J. Muniz. 1964. Pescarias de pequeno atunheiro, ao largo do nordeste Brasileiro [in Portuguese, English summary]. Boletim da Estação de Biologia Marinha da Universidade do Ceará, no. 6, 11 p.

Longline catches include S. cavalla.

Paiva, M.P., and H. Nomura. 1965. Sobre a produção pesqueira de alguns currais-de-pesca do Ceará dados de 1962 a 1964 [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 5, no. 2, p. 175-214.

Wooden fish weirs in Ceará, Brazil, caught Spanish mackerel (= S. brasiliensis), king mackerel, and cero.

Parker, J.C. 1965. An annotated checklist of the fishes of the Galveston Bay system, Texas. University of Texas, Institute of Marine Science, Publication, no. 10, p. 201-220.

The list includes S. maculatus as uncommon.

Parker, R.R. 1969. Validity of the binomen Caligus elongatus for a common parasitic copepod formerly misidentified with Caligus rapax. Journal of the Fisheries Research Board of Canada, vol. 26, no. 4, p. 1013-1035.

S. maculatus and S. cavalla are included in a host and Locality list for Caligus elongatus Nordmann, 1832.

Pearse, A.S. 1949. Observations on flatworms and nemertean collected at Beaufort, N.C. Proceedings of the U.S. National Museum, vol. 100, no. 3255, p. 25-38.

Thoracocotyle paradoxica (family Gastrocotylidae) on king mackerel, S. cavalla, is included.

Pearse, A.S. 1951. Parasitic crustacea from Bimini, Bahamas. Proceedings of the U.S. National Museum, vol. 101, no 3280, p. 341-372.

From 368 fishes (73 spp.) and 504 crustaceans (10 spp.), 34 parasitic crustaceans were taken, including Cybicola elongata on S. maculatus, (probably S. regalis).

Pearse, A.S. 1952. Parasitic crustacea from Texas Coast. University of Texas, Institute of Marine Science, Publications, vol. 2, no. 2, p. 5-42.

The following copepods were identified on Spanish and king mackerel: Caligus productus and Cybicola elongata on S. cavalla, Eigros anurus and Cybicola elongata on S. maculatus.

Perret, W.S., and C.W. Caillouet, Jr. 1974. Abundance and size of fishes taken by trawling in Vermilion Bay, Louisiana. Bulletin of Marine Science, vol. 24, no. 1, p. 52-75.

S. maculatus is included in the trawl catches.

Perret, W.S., W.R. Latapie, J.F. Pollard, W.R. Mock, G.B. Adkins, W.J. Gaidry, and C.J. White. 1971. Fishes and invertebrates collected in trawl and seine samples in Louisiana estuaries. Louisiana Wild Life and Fisheries Commission, Cooperative Gulf of Mexico Estuarine Inventory and Study, Phase IV, Biology, Section I, p. 39-105.

Size, location, and environmental factors are given for catches of S. cavalla and S. maculatus.

Pew, P. 1954. Food and game fishes of the Texas coast. Texas Game and Fish Commission, Series 4, Bulletin, no. 33, 68 p.

The common names, distributions, habits, foods, and color descriptions are provided for king, Spanish, and cero mackerels.

Pillay, T.V.R. 1967. Estuarine fisheries of West Africa, p. 639-646. In G.H. Lauff (ed.), Estuaries. American Association for the Advancement of Science, Publication, no. 83.

S. maculatus and Cybium tritor are listed as fishes commonly caught in West African estuaries.

Pitombeira, M.S., F.V.B. Gomes, and J.M. Martins. 1971. Red blood cell osmotic fragility in the Spanish mackerel Scomberomorus maculatus. Marine Biology, vol. 9, no. 3, p. 250-252.

Blood from 50 S. maculatus (= S. brasiliensis) was analyzed. Corpuscular fragility was very high. Hypotheses were presented to explain results.

Pitombeira, M.S., F.V.B. Gomes, and J.M. Martins. 1973. Hematological data on the king mackerel, Scomberomorus cavalla (Cuvier), from coastal northeast Brazilian waters. Boletim de Zoologia e Biologia Marinha, nova serie, no. 30, p. 843-852.

The results of various hematological measurements are compared with those recorded for the same species from the Atlantic coast of the United States. They were also compared with hematological data on the Spanish mackerel, S. maculatus (Mitchill) (= S. brasiliensis), from NE Brazil as well as from the United States.

Pitombeira, M.S., and J.M. Martins. 1966. A direct method for white blood cell count in fishes. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 6, no. 2, p. 205.

Blood from 90 S. maculatus (= S. brasiliensis) was used to test direct and indirect methods for white blood cell counts. No difference was found between the two methods.

Pitombeira, M.S., and J.M. Martins. 1970. Hematology of the Spanish mackerel, Scomberomorus maculatus. Copeia, 1970, no. 1, p. 182-186.

Results from the examination of 100 specimens (= S. brasiliensis) are presented. Red blood cell counts range from 1,500,000 to 5,430,000/cc (\bar{x} = 3,480,000/cc).

Poey, F. 1868. Synopsis piscium Cubensium. Catologo razonado de los peces de la isla de Cuba, extractado del repertorio fisico-natural de la isla de Cuba, tomo 2.º pagina 279 y siguientes. Imprenta de la Viuda de Barcina y Comp., Habana. 484 p.

Descriptions and local common names are provided for king mackerel and cero as well as for other members of the family Scombridae.

Poey, F. 1875. Enumeratio piscium Cubensium, part I. Anales de la Sociedad Española de Historia Natural, vol. 4, p. 113-161.

Common names, synonyms, descriptions, and local distributions are presented for Cybium caballa, C. regale, and C. acervum (now synonymized with S. regalis).

Poey, F. 1878. Notes on the American species of the genus Cybium. Proceedings of the U.S. National Museum, vol. 1, p. 3-5.

Meristics and color characteristics are given for the genus Cybium, as well as average and maximum sizes appearing in the catches. Data are presented for C. caballa, C. regale, and C. maculatum.

Poey, F. 1883. List of food fishes brought from Key West, Florida, into the markets of Havana. Bulletin of the U.S. Fish Commission for 1882, vol. 2, p. 118.

Cybium caballa (common name:sierra) is listed.

Postel, E. 1950. Poissons de surface. Pêche sur les côtes d'Afrique Occidentale (Dakar), vol. 2, p. 1-77.

The Spanish mackerel of the eastern Atlantic is listed as a distinct species under the name Cybium tritor Cuvier.

Postel, E. 1955. Contribution a l'etude de la quelques Scombridae de l'Atlantique tropico-oriental. Station Oceanographique de Salammbô, Annales, no. 10, p. 3-167.

The systematics of the genera Cybium and Scomberomorus are discussed. The distributions of Cybium regalis, C. maculatus, and C. cavalla are given. Morphometrics, reproductive cycle, and sex ratio data are presented for C. tritor and other species of scombrids found in the eastern Atlantic.

Postel, E. 1966. Les noms des Scombrides. La Peche Maritime, vol. 45, no. 1061, p. 577-581.

The genus Scomberomorus is considered cosmopolitan in warm oceans and constitutes an important element of the surface fishes in all the intertropical belt islands. The name Scomberomorus is often placed among the Cybium in scientific literature, although they are equivalent.

Postel, E. 1973. Scomberomoridae, p. 473-474. In J.C. Hureau and Th. Monod (ed.), CLOFNAM, checklist of the fishes of the north-eastern Atlantic and of the Mediterranean, vol. 1. UNESCO, Paris.

S. maculatus is included in the list. Synonyms and the local distribution are provided.

Powell, D. 1975. Age, growth, and reproduction in Florida stocks of Spanish mackerel, Scomberomorus maculatus. Florida Marine Research Publications, no. 5, 21 p.

Age and growth of S. maculatus were determined by examination and mathematical analysis of otoliths. Reproduction was evaluated on the basis of microscopic examination of ovarian sections. Von Bertalanffy growth equations were determined. Mature Spanish mackerel spawn repeatedly during a prolonged, spring-summer spawning season. Although some evidence indicates that full maturity is probably not attained until age III, other evidence shows that some younger females contain fully developed eggs, suggesting that they may be capable of spawning.

Powell, D., L. M. Dwinell, and S.E. Dwinell. 1972. An annotated listing of the fish reference collection at the Florida Department of Natural Resources Marine Research Laboratory. Florida Department of Natural Resources, Marine Research Laboratory, Special Scientific Report, no. 36, 179 p.

The catalog number, number of specimens, length, collection location, and collection date are given for S. cavalla, S. maculatus, and S. regalis.

Powles, H., and B.W. Stender. 1976. Observations on composition, seasonality and distribution of ichthyoplankton from MARMAP cruises in the South Atlantic Bight in 1973. South Carolina Marine Resources Center, Technical Report Series, no. 6, p. 11-45.

S. cavalla, S. maculatus, and S. regalis young were collected with bongo and neuston nets. These larvae were caught almost exclusively over the outer shelf and slope waters (< 100 m).

Radcliffe, L. 1920. Fishery industries of the United States, report of the Division of Statistics and Methods of the Fisheries for 1918. U.S. Commissioner of Fisheries, Report for 1918, Appendix 10, 167 p.

Kingfish are listed in landings for Washington, D.C.

Radcliffe, L. 1921. Fishery industries of the United States, report of the Division of Statistics and Methods of the Fisheries for 1919. U.S. Commissioner of Fisheries, Report for 1919, Appendix 10, 191 p.

S. cavalla, S. regalis, and S. maculatus are listed in catches in Gulf states.

Radcliffe, L. 1922. Fishery industries of the United States, report of the Division of Statistics and Methods of the Fisheries for 1920. U.S. Commissioner of Fisheries, Report for 1921, Appendix 5, 187 p.

S. cavalla, S. regalis, and S. maculatus are listed for South Atlantic states.

Radcliffe, L. 1923a. Fisheries and market for fishery products in Mexico, Central America, South America, West Indies, and Bermuda. U.S. Commissioner of Fisheries, Report for 1922, Appendix 8, 105 p.

Spanish mackerel and kingfish are included in the list of fishes for Yucatan.

Radcliffe, L. 1923b. Fishery industries of the United States, report of the Division of Fishery Industries for 1921. U.S. Commissioner of Fisheries, Report for 1922, Appendix 9, 136 p.

S. maculatus is listed among fishes caught in Maryland and Virginia.

Randall, J.E. 1967. Food habits of reef fishes of the West Indies. University of Miami, Institute of Marine Sciences, Studies in Tropical Oceanography, vol. 5, p. 665-846.

S. cavalla and S. regalis are included.

Randall, J.E. 1968. Caribbean reef fishes. T.F.H. Publications, Inc., Jersey City, N.J. 318 p.

Description, size, range, and habits of S. regalis, S. maculatus, and S. cavalla are included.

Raney, E.C. 1954a. Cero mackerel, p. 239-240. In A.J. McClane (ed.), The Wise fishermen's encyclopedia. William H. Wise and Co., Inc. New York.

The size, distribution and habitat, habits (schooling and seasonality), foods, and fishing techniques are presented for the cero.

Raney, E.C. 1954b. King mackerel, p. 627-628. In A.J. McClane (ed.), The Wise fishermen's encyclopedia. William H. Wise and Co., Inc. New York.

The size, distribution and habitat, schooling habits, and fishing techniques are discussed for the king mackerel.

Raney, E.C. 1954c. Spanish mackerel, p. 1091. In A.J. McClane (ed.), The wise fishermen's encyclopedia. William H. Wise and Co., Inc., New York.

The size, distribution and habitat, and fishing techniques are presented for the Spanish mackerel.

Reid, G.K., Jr. 1954. An ecological study of the Gulf of Mexico fishes, in the vicinity of Cedar Key, Florida. Bulletin of Marine Science of the Gulf and Caribbean, vol. 4, no. 1, p. 1-94.

S. maculatus, Spanish mackerel, were caught during the survey.

Reid, G.K., Jr. 1956. Ecological investigations in a disturbed Texas coastal estuary. Texas Journal of Science, vol. 8, no. 3, p. 296-327.

Thirteen young S. maculatus were caught (range in size from 17 to 89 mm) in seine and trawl.

Reid, G.K., Jr. 1957. Biologic and hydrographic adjustment in a disturbed Gulf coast estuary. Limnology and Oceanography, vol. 2, no. 3, p. 198-212.

In Galveston Bay, young S. maculatus were captured by trawl and seine in 1955 and by seine in 1956.

Richards, W.J., and W.L. Klawe. 1972. Indexed bibliography of the eggs and young of tunas and other scombrids (Pisces, Scombridae), 1880-1970. U.S. National Marine Fisheries Service, Special Scientific Report--Fisheries, no. 652, 107 p.

References on Scomberomorus sp., S. cavalla, S. maculatus, and S. regalis are given.

Richmond, E.A. 1968. A supplement to the fauna and flora of Horn Island, Mississippi. Gulf Research Reports, vol. 2, no. 3, p. 213-254.

S. maculatus is included in the faunal list.

Rivas, L.R. 1949. Check list of the Florida game and commercial marine fishes including those of the Gulf of Mexico and the West Indies, with approved common names. Florida Board of Conservation, Educational Series, no. 4, 39 p.

S. cavalla, S. regalis, and S. maculatus are listed and common names are given.

Rivas, L.R. 1951. A preliminary review of the Western North Atlantic fishes of the family Scombridae. Bulletin of Marine Science of the Gulf and Caribbean, vol. 1, no. 3, p. 209-230.

Taxonomic characters, synonymies, and key for S. cavalla, S. regalis, and S. maculatus are given.

Rivas, L.R. 1953. The pineal apparatus of tunas and related scombrid fishes as a possible light receptor controlling photolatic movements. Bulletin of Marine Science of the Gulf and Caribbean, vol. 3, no. 3, p. 168-180.

The pineal window is present in the genus Scomberomorus.

Robins, C.R. 1958. Check list of the Florida game and commercial marine fishes. Florida Board of Conservation, Educational Series, No. 12, 44 p.

Common names and range of S. cavalla, S. regalis, and S. maculatus are given.

Robins, C.R. 1971. Distributional patterns of fishes from coastal and shelf waters of the tropical western Atlantic, p. 249-255. In Symposium on investigations and resources of the Caribbean Sea and adjacent regions. FAO Fisheries Report No. 71.2.

S. maculatus is mentioned as unlikely to become established in the insular provinces.

Rodrigues, M.S.S., and R.C.F. Bezerra. 1968. Nota sobre a mortalidade da cavala e da serra no Estado do Ceará [in Portuguese, English summary]. Arquivos da Estação de Biologia Marinha da Universidade Federal do Ceará, vol. 8, no. 2, p. 157-161.

Instantaneous rates of total mortality for S. cavalla and S. maculatus (= S. brasiliensis) off Ceará, Brazil, 1963-76, are given.

Roessler, M.A. 1970. Checklist of fishes in Buttonwood Canal, Everglades National Park, Florida, and observations on the seasonal occurrence and life histories of selected species. Bulletin of Marine Science, vol. 20, no. 4, p. 860-893.

A single specimen of S. cavalla was taken in spring.

Roithmayr, C.M. 1965. Industrial bottomfish fishery of the northern Gulf of Mexico, 1959-63. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 518, 23 p.

S. cavalla and S. maculatus are listed among fishes in industrial bottomfish catches.

Roithmayr, C.M. 1970. Airborne low-light sensor detects luminescing fish schools at night. Commercial Fisheries Review, vol. 32, no. 12, p. 42-51.

Night fishing in Florida for S. maculatus is described. Schools of S. maculatus were detected by luminescence in West Africa and in the Gulf of Mexico.

Rose, C.D., and W.W. Hassler. 1974. Food habits and sex ratios of dolphin Coryphaena hippurus captured in the western Atlantic Ocean off Hatteras, North Carolina. Transactions of the American Fisheries Society, vol. 103, no. 1, p. 94-100.

S. maculatus and S. cavalla are identified as food of dolphin.

Rose, M.M. 1968. Illustrated list of common and scientific names of fishes from the Gulf of Mexico in Latin, Spanish, Russian, and English. U.S. Bureau of Commercial Fisheries, Branch of Foreign Fisheries (Translations), no. A-18, 46 p.

The king mackerel, S. cavalla (sierra or kavalla, mackerel kavalla); Spanish mackerel, S. maculatus (serrucho or piatnistaia mackerel); and cero, S. regalis (pintada or korolevskaia mackerel) are illustrated.

Rounsefell, G.A. 1954. Biology of the commercial fishes of the Gulf of Mexico, p. 507-512. In P.S. Galtsoff (ed.), Gulf of Mexico, its origin, waters, and marine life. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 55, no. 89.

The Spanish mackerel is included in a group of fish existing on the perimeter of the Gulf whose life histories, so far as is known, renders them more or less independent of conditions in the inner bays. Commercial landings by the Gulf States are presented for both king and Spanish mackerels.

Roux, C. 1963. Les côtes du Brésil et l'histoire naturelle des poissons du Cuvier et Valenciennes. Mémoires de l'Institut Français d'Afrique Noire, no. 68, p. 385-435.

Sixty-four families of fishes are listed. Cybium cavalla (S. cavalla), Scomber regalis (S. regalis), and Scomber maculatus (= S. brasiliensis) are included under family Thunnidae.

Ryder, J.A. 1881. Development of the Spanish mackerel (Cybium maculatum). Bulletin of the U.S. Fish Commission, vol. 1, p. 135-173.

Development of ovaries, eggs, and larvae are described.

Ryder, J.A. 1887. On the development of osseous fishes, including marine and freshwater forms. U.S. Commissioner of Fish and Fisheries, Report for 1885, part 13, p. 489-604.

Cross sections and longitudinal sections of the embryo of S. maculatus are presented.

Sabins, D.S., and F.M. Truesdale. 1974. Diel and seasonal occurrence of immature fishes in a Louisiana tidal pass. Proceedings of the 28th Annual Conference, Southeastern Association of Game and Fish Commissioners, White Sulphur Springs, W. V., 1974, p. 161-171.

Fifteen juvenile Spanish mackerel were caught by trawl in Caminada Pass, June 1971-August 1972.

Sal'nikov, N.E. 1969. Fishery research in the Gulf of Mexico and the Caribbean Sea, p. 78-171. In A.S. Bogdanov (ed.), Soviet-Cuban fishery research. [Translated from Russian.] NTIS TT 69-59016. 350 p.

Three species of Scomberomorus: S. cavalla, S. regalis, and S. maculatus are discussed as being commercially important ichthyofauna found in the Gulf of Mexico.

Sanz Echeverrēa, J. 1950. Notas sōbre otolitos de peces procedentes de las costas del Sahara, segunda parte. Boletín del Instituto Español de Oceanografía, no. 27, p. 1-19.

A description of the sagittae of S. maculatus is presented. The fish length and sex is provided for the specimen.

Saunders, D.C. 1966. Differential blood cell counts of 121 species of marine fishes of Puerto Rico. American Microscopical Society, Transactions, vol. 85, no. 3, p. 427-449.

The list of fishes studied includes the cero, S. regalis.

Scaccini, A. 1941. Primo elenco di pesci raccolti in Atlantico nelle acque della Mauritania del Sahara spagnolo e delle Canarie. *Thalassia*, vol. 4, no. 10, p. 1-49.

The author placed Cybium tritor Cuvier 1831, C. altipinnis Duméril 1858, C. maculatus Vinciguerra 1890, Scomberomorus argyreus Fowler 1905, S. maculatus Fowler 1936 in synonymy with Scomber maculatus Mitchell.

Schroeder, W.C. 1924. Fisheries of Key West and the clam industry of southern Florida. U.S. Commissioner of Fisheries, Report for 1923, Appendix 12, 74 p.

Commercial food fishes in Key West include S. maculatus, S. cavalla, and S. regalis. Geographic range and size is provided for each species.

Schwartz, F.J., and J. Tyler. 1970. Marine fishes common to North Carolina. North Carolina Department of Conservation and Development, Division of Commercial and Sports Fisheries, Morehead City, N.C. 32 p.

Spanish mackerel and king mackerel are described and illustrated.

Sette, O.E. 1926. Fishery industries of the United States, 1924. U.S. Commissioner of Fisheries, Report for 1925, Appendix 7, p. 219-408.

S. regalis, S. cavalla, and S. maculatus are listed among fishes landed in South Atlantic states.

Sette, O.E. 1927. Fishery industries of the United States, 1925. U.S. Commissioner of Fisheries, Report for 1926, Appendix 5, p. 201-322.

S. maculatus, S. regalis, and S. cavalla are listed among fishes landed in Gulf states in 1923.

Sette, O.E. 1928. Fishery industries of the United States, 1926. U.S. Commissioner of Fisheries, Report for 1927, Appendix 5, p. 337-483.

S. maculatus is listed among fishes of Maryland and Virginia.

Sette, O.E., and R.H. Fiedler. 1929. Fishery industries of the United States, 1927. U.S. Commissioner of Fisheries, Report for 1928, Appendix 9, p. 401-547.

Spanish mackerel and cero, or kingfish, are listed for Atlantic States.

Shubnikov, D.A. 1974. Ecological groups in the Scombridae and their origin. Journal of Ichthyology, vol. 14, no. 5, p. 633-648.

Characteristics of the present distribution and schooling behavior of mackerels were examined. Trophic factors govern the existing distribution of species in the family and the origin of intraspecific ecological groups. A phylogenetic outline is given of the distribution of the family in the main biotopes of the pelagic zone. Spanish, king, and cero mackerels are included.

Siddiqi, A.H., and R.M. Cable. 1960. Digenetic trematodes of marine fishes of Puerto Rico. New York Academy of Sciences, vol. 17, no. 3, p. 257-369.

A new trematode from an unidentified species of Scomberomorus is described.

Siebenaler, J.B. 1952. Studies of "trash" caught by shrimp trawlers in Florida. Proceedings of the Gulf and Caribbean Fish Institute, 4th Annual Session, 1951, p. 94-99.

S. maculatus and S. cavalla were caught in shrimp trawls.

Silas, E.G. 1967. Parasites of scombroid fishes. Part I. Monogenetic trematodes, digenetic trematodes, and cestodes, p. 799-875. In Proceedings of the symposium on scombroid fishes, Mandapam Camp, 1962, part 3. Marine Biological Association of India, Symposium Series, 1.

Monogenetic trematodes found in S. cavalla and S. maculatus; digenetic trematodes found in S. maculatus and S. regalis; cestodes in all three species are listed.

Silas, E.G., and A.N.P. Ummerkutty. 1967. Parasites of scombroid fishes. Part II. Parasitic Copepoda, p. 876-993. In Proceedings of the symposium on scombroid fishes, Mandapam Camp, 1962, Part 3. Marine Biological Association of India, Symposium Series, 1.

Parasitic copepods found on S. cavalla, S. maculatus and S. regalis are listed.

Simmons, E.G. 1957. An ecological survey of the upper Laguna Madre of Texas. University of Texas, Institute of Marine Science, Publications, vol. 4, no. 2, p. 156-200.

The list of species surveyed includes S. maculatus, Spanish mackerel.

Simpson, J.G., and R.C. Griffiths. 1967. The fishery resources of Venezuela and their exploitation [in Spanish and English]. Venezuela Ministerio de Agricultura y Cría, Investigaciones Pesqueras, Serie Recursos y Explotacion Pesqueros, vol. 1, no. 5, p. 172-206.

Small boat fisheries for S. regalis, S. cavalla, and S. maculatus (= S. brasiliensis) exist in Venezuela. Their catch is sold fresh in the market, or is used for subsistence.

Simpson, J.G., R.C. Griffiths, and C.E. Atiland. 1965. A review of the investigation and increasing exploitation of the fishery resources of Venezuela. Proceedings of the Gulf and Caribbean Fisheries Institute, 17th Annual Session, 1964, p. 66-82.

S. regalis, S. maculatus (= S. brasiliensis), and S. cavalla are listed among the scombroid fisheries harvested.

Sindermann, C.J. 1970. Principal diseases of marine fish and shellfish. Academic Press, New York. 369 p.

Reference is made to myxosporidean in S. maculatus and an unsuccessful attempt to infect mammals with pleurocercoid larvae from S. maculatus.

Smiley, C.W. 1881. The Spanish mackerel (Cybium maculatum) and its artificial propagation. Proceedings of the American Association for the Advancement of Science, 29th meeting, 1880, p. 575-583.

The general biology of eggs and larvae of S. maculatus (from Richards and Klawe, 1972) is discussed.

Smiley, C.W. 1885. Notes upon fish and the fisheries. Bulletin of the U.S. Fish Commission vol. 5, p. 65-112.

A Spanish mackerel, Cybium maculatum, jumped into a boat at night.

Smiley, C.W. 1887. Notes upon fish and the fisheries. Bulletin of the U.S. Fish Commission for 1886, vol. 6, p. 401-416.

According to Earll (1884) eggs of S. maculatus average 0.04 inches in diameter.

Smith, G.B., H.M. Austin, S.A. Bortone, R.W. Hastings, and L.H. Ogren. 1975. Fishes of the Florida Middle Ground with comments ecology and zoogeography. Florida Marine Research Publication, no. 9, 14 p.

S. cavalla is included in a checklist of fishes for this area in the Gulf of Mexico.

Smith, H.M. 1892. Notes on a collection of fishes from the lower Potomac River, Maryland. Bulletin of the U.S. Fish Commission for 1890, vol. 10, p. 63-72.

S. maculatus is listed. A 7.5-pound specimen was taken in a pound net in August 1888.

Smith, H.M. 1893. Report on the fisheries of the South Atlantic States. Bulletin of the U.S. Fish Commission for 1891, vol. 11, p. 271-356.

S. maculatus landings and values by states for 1889 and 1890 are included.

Smith, H.M. 1894a. Economic and natural-history notes on fishes of the northern coast of New Jersey. Bulletin of the U.S. Fish Commission for 1892, vol. 12, p. 365-380.

S. regalis is listed as uncommon. S. maculatus is listed as the second most important fish taken in pound nets.

Smith, H.M. 1894b. Statistics of the fisheries of the United States. Bulletin of the U.S. Fish Commission for 1893, vol. 13, p. 389-417.

Landings and values of Spanish mackerel by states are included.

Smith, H.M. 1895. A statistical report on the fisheries of the middle Atlantic States. Bulletin of the U.S. Fish Commission for 1894, vol. 14, p. 341-467.

Landings and values of S. regalis and S. maculatus by states are given for 1889-1891.

Smith, H.M. 1896. Notes on an investigation of the menhaden fishery in 1894, with special reference to the food-fishes taken. Bulletin of the U.S. Fish Commission for 1895, vol. 15, p. 285-302.

Fishes taken with menhaden include S. regalis and S. maculatus.

Smith, H.M. 1898. Fishes found in the vicinity of Woods Hole. Bulletin of the U.S. Fish Commission for 1897, vol. 17, p. 85-111.

S. maculatus, S. cavalla, and S. regalis are listed.

Smith, H.M. 1907. The fishes of North Carolina. N.C. Geological and Economic Survey, vol. 2, 453 p.

This classical work provides meristics, morphometrics, color descriptions, seasonal occurrence, and fisheries for Spanish, king, and cero mackerels on pages 190-194.

Smith, J.L.B. 1953. The sea fishes of southern Africa. General News Agency, Ltd., South Africa. 564 p.

The Spanish mackerel, S. maculatus, of the region is described. Meristics, color, size, local distribution, and angling quality are all mentioned.

Sparks, A.K. 1958. Some digenetic trematodes of fishes of Grand Isle, Louisiana. Proceedings of the Louisiana Academy of Sciences, vol. 20, p. 71-82.

Unidentified hermiurid and unidentified gasterostome trematodes were found in both S. maculatus and S. cavalla.

Springer, S., and H.R. Bullis, Jr. 1956. Collections by the Oregon in the Gulf of Mexico. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 196, 134 p.

The localities and station numbers for catches of S. maculatus, S. cavalla, and S. regalis are given.

Springer, V.G., and J. Pirson. 1958. Fluctuations in the relative abundance of sport fishes as indicated by the catch at Port Aransas, Texas, 1952-1965. University of Texas, Institute of Marine Science, Publications, vol. 5, p. 169-185.

Spanish mackerel, S. maculatus, are most frequently caught from March through October. The times of peak months vary, but the greatest catches occur in March and April and again in July, August, and September. Kingfish, S. cavalla, is taken primarily in the summer-time.

Springer, V.G., and K.D. Woodburn. 1960. An ecological study of the fishes of the Tampa Bay area. Florida State Board of Conservation Marine Laboratory, Professional Papers Series, no. 1, 104 p.

Seven juvenile Spanish mackerel were collected. Information on size, salinity, and temperature is presented. Seasonal occurrence and movements are discussed for king mackerel.

Sproston, N.G. 1946. Asynopsis of the monogenetic trematodes. Transactions of the Zoological Society of London, vol. 25, no. 4, p. 185-600.

S. maculatus is listed as a host. Pseudaxine mexicana was present on the gills of a fish from Mexico, Thoracocotyle crocea was present on the gills of a specimen from the New York Aquarium and T. paradoxica on the gills of a Spanish mackerel from Mexico.

Starck, W.A., II, and W.P. Davis. 1966. Night habits of fishes of Alligator Reef, Florida. *Ichthyologica, the Aquarium Journal*, vol. 38, no. 4, p. 313-356.

S. regalis was seen at night swimming in midwater, behaving much as in the day.

Starks, E.C. 1910. The osteology and mutual relationships of the fishes belonging to the family Scombridae. *The Journal of Morphology*, vol. 21, no. 1, p. 77-99.

A comparative study of the osteology of Scomberomorus, with other genera of the family included.

Stevenson, C.H. 1893. Report on the coast fisheries of Texas. U.S. Commissioner of Fish and Fisheries, Report for 1889 to 1891, part 17, p. 373-420.

Landings include those for Spanish mackerel.

Storer, D.H. 1853. A history of the fishes of Massachusetts. *American Academy of Arts and Sciences*, new series, vol. 5, p. 122-168.

Synonymies, description, and distribution are given for Cybium maculatum.

Struhsaker, P. 1969. Demersal fish resources: Composition, distribution, and commercial potential of the Continental Shelf stocks off southeastern United States. *Fishery Industrial Research*, vol. 4, no. 7, p. 261-300.

S. cavalla and S. maculatus are listed as being taken occasionally and very commonly in bottom trawls.

Suarez-Cabro, J.A., and M.A. Rolon. 1974. La pesca en Puerto Rico, 1973 [in Spanish and English]. Puerto Rico Department of Agriculture, Agriculture and Fisheries Contributions, vol. 6, no. 1, 48 p.

S. cavalla and S. regalis are included. This paper covers statistical areas, landings, production, operating units, gear, and craft.

Sumner, F.B., R.C. Osburn, and L.J. Cole. 1913a. A biological survey of the waters of Woods Hole and vicinity. Part I. Section I. - Physical and zoological. Bulletin of the U.S. Bureau of Fisheries for 1911, vol. 31, p. 11-442.

S. maculatus, S. regalis, S. cavalla are listed among the fishes. Ranges are given for each species.

Sumner, F.B., R.C. Osburn, and L.J. Cole. 1913b. A biological survey of the waters of Woods Hole and vicinity. Part II. Section III. - A catalogue of the marine fauna. Bulletin of the U.S. Bureau of Fisheries for 1911, vol. 31, p. 549-794.

S. maculatus, S. regalis, S. cavalla are listed. The synonymies, foods, parasites, and occurrence are included.

Sutherland, D.F. 1977. Catch and catch rates of fishes caught by anglers in the St. Andrew Bay system, Florida, and adjacent coastal waters, 1973. U.S. National Marine Fisheries Service, Special Scientific Report--Fisheries, no. 708, 9 p.

A sport creel survey of anglers fishing from charter boats and fixed platforms is discussed. King mackerel constituted 73.5% of the total charter boat catch and Spanish mackerel 5%. Spanish mackerel were also caught by anglers fishing from fixed platforms.

Swarts, W. 1969. Blood studies of some marine teleosts. Transactions of the American Fisheries Society, vol. 98, no. 2, p. 328-331.

Hematocrit, erythrocyte, and hemoglobin values are given for S. regalis.

Swingle, H.A. 1971. Biology of Alabama estuarine areas - Cooperative Gulf of Mexico estuarine inventory. Alabama Marine Resources Bulletin, no. 5, 123 p.

Occurrence, commercial landings, and spawning of S. cavalla and S. maculatus are discussed.

Sykes, J.E. 1964. Requirements of Gulf and South Atlantic estuarine research. Proceedings of the Gulf and Caribbean Fisheries Institute, 16th Annual Session, 1963, p. 113-120.

S. maculatus occurs as juveniles in the Tampa Bay estuary.

Sykes, J.E., and J.H. Finucane. 1966. Occurrence in Tampa Bay, Florida, of immature species dominant in Gulf of Mexico commercial fisheries. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 65, no. 2, p. 369-379.

Juvenile S. maculatus were collected in Tampa Bay. Sizes, season, and area of collection are presented.

Tabb, D.C., and R.B. Manning. 1961. A checklist of the flora and fauna of northern Florida Bay and adjacent brackish waters of the Florida mainland collected during the period July, 1957 through September, 1960. Bulletin of Marine Science of the Gulf and Caribbean, vol. 11, no. 4, p. 552-649.

S. cavalla and S. maculatus were collected from Florida brackish waters.

Tagatz, M.E. 1967. Fishes of the St. Johns River, Florida. Quarterly Journal of the Florida Academy of Science, vol. 30, no. 1, p. 25-50.

S. maculatus were caught in June and September. The salinity was 15.8-22.5 o/oo, the temperature was 28.7-30.0°C.

Tagatz, M.E., and D.L. Dudley. 1961. Seasonal occurrence of marine fishes in four shore habitats near Beaufort, N.C., 1957-60. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries, no. 390, 19 p.

S. maculatus was included in the catches. Catch data, temperature, and salinity are presented.

Tagatz, M.E., and E.P.H. Wilkens. 1973. Seasonal occurrence of young Gulf menhaden and other fishes in a northwestern Florida estuary. U.S. National Marine Fisheries Service, Special Scientific Report--Fisheries, no. 672, 14 p.

S. maculatus is included among the catches. The size range is given along with salinity and temperature.

Tamura, T., and W.J. Wisby. 1963. The visual sense of pelagic fishes, especially the visual axis and accommodation. Bulletin of Marine Science of the Gulf and Caribbean, vol. 13, no. 3, p. 433-448.

S. cavalla was included among 10 species studied for accommodation, cone density, and visual axis.

Taylor, C.C., H.B. Bigelow, and H.W. Graham. 1957. Climatic trends and the distribution of marine animals in New England. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 57, no. 115, p. 293-345.

S. regalis is listed as an example of a southern species in New England waters.

Taylor, H.F. 1919. Mortality of fishes on the west coast of Florida. U.S. Commissioner of Fisheries, Report for 1917, Appendix 3, 24 p.

S. regalis was listed among fishes killed. Possible causes include: 1) water from the Everglades charged with tannin and products of decomposition of palmettoes and mangroves; 2) extraordinary abundance of Peridinium; 3) a disease, fungoid, parasitic, or bacterial; 4) dilution of the water by unusually heavy rain; 5) an issue of gas, volcanic, or natural; and 6) earthquake or seaquake.

Taylor, H.F. 1924. Fishery industries of the United States. Report of the Division of Fishery Industries for 1922. U.S. Commissioner of Fisheries, Report for 1923, Appendix 5, 111 p.

S. maculatus and S. regalis are listed among fishes caught in New York, New Jersey, Pennsylvania, and Delaware.

Taylor, H.F. 1951. Survey of marine fisheries of North Carolina. University of North Carolina Press, Chapel Hill. 555 p.

Spanish mackerel, S. maculatus, is the most important member of the mackerel family in the commercial fisheries of North Carolina. Their migrations, temperature, range, and reproduction are discussed. S. cavalla is a popular anglers' fish and is often present among schools of S. maculatus and S. regalis.

Taylor, J.L., D.L. Feigenbaum, and M.L. Sturza. 1973. Utilization of marine and coastal resources. In A summary of knowledge of the eastern Gulf of Mexico, 1973. Coordinated by the State University System of Florida, Institute of Oceanography, St. Petersburg.

Fisheries for S. maculatus and S. cavalla are reviewed.

Tinsley, J. 1964. The sailfish, swashbuckler of the open sea. University of Florida Press, Gainesville. 216 p.

The genus Scomberomorus (including king mackerel, cero mackerel, and Spanish mackerel) are used as bait to catch sailfish.

Thomas, J., P. Wagner, and H. Loesch. 1971. Studies on the fishes of Barataria Bay, Louisiana, an estuarine community. Louisiana State University, Coastal Studies Bulletin, no. 6, p. 56-66.

Spanish mackerel are referred to as "adventitious marine visitors" which have no apparent estuarine requirements. King mackerel are referred to in a list of the fishes collected.

Townsend, C.H. 1900a. Statistics of the fisheries of the Gulf States. U.S. Commissioner of Fish and Fisheries, Report for 1899, part 15, p. 105-169.

Landings of kingfish and Spanish mackerel for 1897 are included.

Townsend, C.H. 1900b. Statistics of the fisheries of the South Atlantic States. U.S. Commissioner of Fish and Fisheries, Report for 1889, part 15, p. 171-227.

Landings of kingfish and Spanish mackerel for 1897 are included.

Townsend, C.H. 1901a. Statistics of the fisheries of the Middle Atlantic States. U.S. Commissioner of Fish and Fisheries, Report for 1900, part 16, p. 195-310.

Data for kingfish and Spanish mackerel for 1897 are included.

Townsend, C.H. 1901b. Statistics of the fisheries of the New England States. U.S. Commissioner of Fish and Fisheries, Report for 1900, part 16, p. 311-386.

data for kingfish and Spanish mackerel for 1897 are included

Tracy, H.C. 1907. The fisheries of Rhode Island. III. The fishes of the mackerel family. Rhode Island Commissioners of Inland Fisheries, 37th Annual Report, p. 33-64.

Spanish mackerel, S. maculatus, is not very common in Rhode Island waters, with only a few dozen specimens taken each year between the middle of August and October in Narragansett Bay. Cereen, or kingfish, S. regalis, is rare in Narragansett Bay, taken usually in autumn.

Tracy, H.C. 1910. Annotated list of fishes known to inhabit the waters of Rhode Island. Rhode Island Commissioners of Inland Fisheries, 40th Annual Report, p. 35-169.

The Spanish mackerel, S. maculatus, and the kingfish, S. regalis, are described and illustrated, with distinguishing characters listed. Spanish mackerel arrive in Narragansett Bay late in July and disappear from the area by early October. The kingfish, or cereen, is not uncommon at Woods Hole, Mass. but is rare in Narragansett Bay.

Truit, R.V., B.A. Bean, and H.W. Fowler. 1929. The fishes of Maryland. Maryland Conservation Department, Bulletin, no. 3, p. 1-120.

S. regalis is listed from the seaside of Worcester County (Maryland).

Turner, W.R., and G.N. Johnson. 1973. Distribution and relative abundance of fishes in Newport River, North Carolina. U.S. National Marine Fisheries Service, Special Scientific Report--Fisheries, no. 666, 23 p.

S. maculatus is included in the catches and the salinity is given.

Tybring, O. 1887. Poisonous fish. Bulletin of the U.S. Fish Commission for 1886, vol. 6, p. 148-151.

Cybium cavalla sometimes causes indigestion when consumed by humans.

Uhler, P.R., and O. Luger. 1876. List of the fishes of Maryland. Report of the Commissioners of Fisheries of Maryland, 1876, p. 69-176.

Fishes of 71 families including Scombridae are listed. A general description (size, color, and meristics), synonymies, and notes on occurrence and fishing are provided for Cybium maculatum, and synonymies and notes on occurrence of C. regale.

Vasil'ev, G.D. and Yu. A. Torin. 1969. Oceanographic and fishing-biological characteristics of the Gulf of Mexico and the Caribbean Sea, p. 225-250. In A.S. Bogdanov (ed.), Soviet-Cuban fishery research. [Translated from Russian.] NTIS TT-69-59016.

Catches of fishermen from Panama, Honduras, Venezuela, Haiti, and Cuba consist of Spanish mackerel (= S. brasiliensis), skipjack tuna, and other tunas inhabiting shelf waters. Fishing is done with manually operated long lines and angling rods.

Vasconelos Pérez, M.J. 1976. Observaciones sobre reproducción, fecundidad y factor de condición de la sierra, Scomberomorus maculatus (Mitchell), en las costas del Estado de Veracruz, p. 239-252. In Memorias. Reunión sobre los Recursos de Pesca Costera de México, Veracruz, Ver. Mexico. Instituto Nacional de Pesca, Mexico.

This paper presents results on fecundity, reproduction, and condition factor for S. maculatus, one of the most important fish of the Veracruz coast, representing 80% of the total fish production of the region. Reproduction occurs during June, July, and August. Mean fecundity was estimated at 150,000 ova.

Verril, A.E. 1880. Artificial propagation of the Spanish mackerel (Cybium maculatum). American Journal of Science, vol. 3, no. 20, p. 251.

The general biology of eggs and larvae of S. maculatus is given.

Viera, G.H.F., and M.C. Caland. 1968. Aspectos sanitários do pescado marinho do gênero Scomberomorus Lacépède; Salgado no Estado do Ceará [in Portuguese, English summary]. Boletim da Estação de Biologia Marinha da Universidade Federal do Ceará, no. 18, p. 1-7.

Sanitary conditions of salted fishes of genus Scomberomorus in Ceará, Brazil, are discussed.

Uhler, P.R., and O. Lugger. 1876. List of the fishes of Maryland. Report of the Commissioners of Fisheries of Maryland, 1876, p. 69-176.

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Sanitary conditions of salted fishes of genus Scomberomorus in Ceará, Brazil, are discussed.

Voss, G.L. 1953. A contribution to the life history and biology of the sailfish, Istiophorus americanus Cuv. and Val., in Florida waters. Bulletin of Marine Science of the Gulf and Caribbean, vol. 3, no. 3, p. 206-240.

Food items in sailfish stomachs are listed. One entry is "Scomberomorus regalis, painted mackerel."

Wagner, D.P., and R.S. Wolf. 1974. Results of troll fishing explorations in the Caribbean. Marine Fisheries Review, vol. 36, no. 9, p. 35-43.

S. cavalla and S. regalis were caught during exploratory trolling in the Caribbean.

Wagner, P.R. 1973. Seasonal biomass, abundance, and distribution of estuarine dependent fishes in the Caminada Bay system of Louisiana. Ph.D. thesis, Louisiana State University, Baton Rouge, 193 p. Dissertation Abstracts, vol. 34, no. 6, p. 2568B-2569B.

S. cavalla and S. maculatus are included in a list of fishes and both are classified as "top carnivores" and "primarily marine."

Walls, J.G. 1975. Fishes of the northern Gulf of Mexico. T.F.H. Publications, Neptune City, N.J. 432 p.

S. cavalla, S. maculatus, and S. regalis are described.

Ward, H.L. 1954. Parasites of marine fishes of the Miami region. Bulletin of Marine Science of the Gulf and Caribbean, vol. 4, no. 3, p. 244-261.

Trematodes (Bucephalopsis arcuatus) and cestodes (Tentacularia coryphaenae) are listed from S. cavalla. Linton (1905) referred to the trematode as Gasterostomum arcatum and listed the host as the kingfish, S. regalis (Bloch).

Whiteleather, R.T., and H.H. Brown. 1945. An experimental fishery survey in Trinidad, Tobago and British Guiana with recommended improvements in methods and gear. Anglo-American Caribbean Commission, Washington, D.C. 130 p.

Oceanic and continental pelagic species are discussed. Notes on the habitats, commercial and recreational fisheries, and schooling behavior of the king mackerel and Spanish mackerel are included.

Wickham, D.A., J.W. Watson, Jr., and L.H. Orgren. 1973. The efficacy of midwater artificial structures for attracting pelagic sportfish. Transactions of the American Fisheries Society, vol. 102, no. 3, p. 563-572.

S. cavalla were caught in greater numbers around structures than in the control area.

Wicklund, R. 1969. Commensalism between sharks and pelagic fishes. Underwater Naturalist, vol. 6, no. 2, p. 35-36.

S. cavalla, Caranx ruber, and Elagatis bipinnulata were observed associating with Carcharhinus falciformis. In each case, the fish closely followed the shark, occasionally moving in and brushing the shark's side.

Wilcox, W.A. 1898. Commercial fisheries of Indian River, Florida. U.S. Commissioner of Fish and Fisheries, Report for 1896, part 12, p. 249-262.

Landings and value of Spanish mackerel are given.

Wilcox, W.A. 1902. The fisheries and fish trade of Porto Rico. Bulletin of the U.S. Fish Commission for 1900, vol. 20, part 1, p. 27-48.

S. maculatus, or sierra, is seen in the market at San Juan where it sells at a price of 7 cents per pound. The "silgo" or trolling line is used to catch Spanish mackerel.

Wilcox, W.A. 1904. The fisheries and fish trade of Porto Rico in 1902. U.S. Commissioner of Fish and Fisheries, Report for 1902, part 28, p. 367-395.

Locality, method of capture, fishery, and landings for king mackerel and Spanish mackerel are included.

Windom, H., R. Stickney, R. Smith, D. White, and F. Taylor. 1973. Arsenic, cadmium, copper, mercury and zinc in some species of North Atlantic finfish. Journal of the Fisheries Research Board of Canada, vol. 30, no. 2, p. 275-279.

As, Cd, Cu, Hg, and Zn were found in muscles of six specimens of S. maculatus.

Wittenberg, J.B., and R.L. Haedrich. 1974. The choroid rete mirabile of the fish eye. II. Distribution and relation to the pseudobranch and to the swimbladder rete mirabile. Biological Bulletin (Woods Hole), vol. 146, no. 1, p. 137-156.

S. cavalla was found to have choroid rete.

Wolf, R.S. 1974. Minor miscellaneous exploratory/experimental fishing activities in the Caribbean and adjacent waters. Marine Fisheries Review, vol. 36, no. 9, p. 78-87.

Drift gill nets were set at night and during the day to test the relative effectiveness of monofilament and multifilament nylon gill nets. Four day drift sets, averaging two-hour soak, produced one S. maculatus. Eight drift net sets at night produced 96 Spanish mackerel.

Wolf, R.S., and G.R. Chislett. 1974. Trap fishing exploration for snapper and related species in the Caribbean and adjacent waters. Marine Fisheries Review, vol. 36, no. 9, p. 49-61.

Frozen Spanish mackerel was used as bait in pot or trap fishing for snapper and other demersal species in the inshore waters of the Caribbean. Atlantic herring, Spanish mackerel, and West Indian "robin" (scad) baits all produced the same catch rate which exceeded that of flying fish and spats.

Wolf, R.S., and W.F. Rathjen. 1974. Exploratory fishing activities of the UNDP/FAO Caribbean fishery development project, 1965-1971: A summary. *Marine Fisheries Review*, vol. 36, no. 9, p. 1-8.

Over 2,000 pounds (900 kg) of Spanish mackerel were caught with experimental drift gill nets. Bottom gill net sets were generally nonproductive, although 417 pounds of *Scomberomorus* spp. were caught in Kingston Harbor, Jamaica.

Woolam, M.B. 1970. Description and distribution of larvae and early juveniles of king mackerel, *Scomberomorus cavalla* Cuvier, and Spanish mackerel, *Scomberomorus maculatus* (Mitchill); (Pisces: Scombridae); in the western North Atlantic. Florida Department of Natural Resources, Marine Research Laboratory, Technical Series, no. 61, 35 p.

Larval and juvenile stages of king mackerel are described, and some of the larval stages of the Spanish mackerel are redescribed. Identification, pigmentation, meristics, seasonality, and distribution are presented and representative specimens of each species are figured.

Wood, W.M. 1885. Report of operations in hatching eggs of Spanish mackerel in Chesapeake Bay by steamer *Fish Hawk* during the summer of 1883. U.S. Commissioner of Fish and Fisheries, Report for 1883, part 11, p. 1089-1094.

An apparatus for hatching Spanish mackerel is described. Eggs were obtained in June and July.

Zaneveld, J.S. 1962. The fishery resources and the fishery industries of the Netherland Antilles. Proceedings of the Gulf and Caribbean Fisheries Institute, 4th Annual Session, 1961, p. 137-171.

S. maculatus, S. cavalla, and S. regalis are listed in the tables.

Zharov, V.L. 1967. The systematics of scombroid fish. (suborder Scombroidei, order Perciformes) [in Russian]. Voprosy Ikhtiologii, vol. 7, no. 2, p. 209-224.

The classification and phylogenetic scheme of Scombroideae is discussed. A table comparing the diagnostic characters and geographical ranges of Scombridae, Sardidae, Thunnidae, and Scomberomoridae (Scomberomorus included) are presented.

SUBJECT INDEX

1. Taxonomy (includes keys, synonymies, and comparisons of fish from different geographical locations)
2. Physical description (includes meristics, morphometrics, size, and color)
3. Distribution (includes range extensions as well as overall geographical distribution)
 - 3a. Seasonal occurrence
 - 3b. Migrations and tagging
4. Anatomy and physiology
5. Parasites, diseases, and anomalies
6. Predators
7. Habitat (includes depth, distance from land, temperature, and salinity)
8. List of fishes (includes biological and ecological surveys and museum collections (M))
 - 8a. North America (general)
 1. New England
 2. Mid-Atlantic (New York, New Jersey and Delaware)
 3. Chesapeake (Virginia and Maryland)
 4. South Atlantic
 5. Gulf
 - 8b. Central America and Caribbean
 - 8c. South America
 - 8d. Africa
9. Behavior (Schooling and commensalism)
10. Reproduction (reproductive cycle, fecundity, spawning ecology, and sex ratios)
11. Artificial propagation
12. Eggs and larvae (descriptions and distributions)
13. Juveniles (descriptions and distribution)
14. Foods and feeding
15. Age, growth, and mortality (includes age composition of landings (catch))
16. Length-weight relationships
17. Commercial fishing (areas, gear, landings, effort, catch per unit effort, and resource potential -- includes exploratory fishing (Explor))
 - 17a. Products (includes specially treated mackerel products).
18. Recreational fishing (areas, gear, landings, effort, and catch per unit effort)
19. Man made habitats
20. Miscellaneous

Serra Spanish mackerel, Scomberomorus brasiliensis

1. Taxonomic identity

Collette, Russo, and Zavala-Camin, 1978
Dahl, 1971
Menezes, 1972
Pitombeira, Gomes, and Martins, 1973
2. Physical description

Bastos, 1966a
Cervigon, 1966
Collette, Russo, and Zavala-Camin, 1978
Meek and Hildebrand, 1923
Menezes, 1972
3. Distribution

Cervigon, 1966
Collette, Russo, and Zavala-Camin, 1978
Meek and Hildebrand, 1923
- 3a. Seasonal occurrence

Costa and Paiva, 1965
Fontales, A.A., Filho, 1968
Gines, Cervigon, and Gomez, 1971
4. Anatomy and physiology

Alves, 1969
Alves and Tomé, 1968a
Alves and Tomé, 1968c
Alves and Tomé, 1970
Bastos, 1966b
Martins and Pitombeira, 1968
Pitombeira, Gomes, and Martins, 1971
Pitombeira, Gomes, and Martins, 1973
Pitombeira and Martins, 1966
Pitombeira and Martins, 1970
5. Parasites, diseases, and anomalies

Alcantara, P., Filho, 1971
Bastos, 1965b
Dawson, 1971
Kohn, 1961
7. Habitat

Bashirullah, 1973
Lima and Paiva, 1966
Lowe, 1963
8. List of fishes
- 8b. Central America and Caribbean

Gilbert and Kelso, 1971
Meek and Hildebrand, 1923
- 8c. South America

Bashirullah, 1973
Buen, 1972
Ewald, Brandhorst, Durant
Espinosa, and Diaz, 1971
Gines and Cervigon, 1968b
Fowler, 1953
Mago Leccia, 1970
Oliveira, 1974
Roux, 1963 (M)
10. Reproduction

Alves and Tomé, 1968b
Alves and Tomé, 1968c
Gesteira, 1972
Lowe, 1963
13. Juveniles

Eckles, 1949
14. Foods

Cervigon, 1966
Lowe, 1963
Menezes, 1970

Serra Spanish mackerel, Scomberomorus brasiliensis

15. Age, growth, and mortality

Costa and Almeida, 1974
Costa and Paiva, 1966 (catch)
Costa and Paiva, 1967 (catch)
Costa and Paiva, 1968 (catch)
Costa and Paiva, 1969 (catch)
Costa and Paiva, 1970 (catch)
Costa and Paiva, 1971 (catch)
Gesteira, 1972
Nomura, 1967

16. Length-weight relationship

Nomura, 1967
Nomura and Costa, 1966
Nomura and Costa, 1968

17. Commercial fishing

Alcantara, P., Filho, 1972b
Almeida, 1974
Cervigon, 1966
Collyer and Aguiar, 1972
Costa and Almeida, 1974
Costa and Paiva, 1963
Costa and Paiva, 1964
Costa and Paiva, 1965
Costa and Paiva, 1966
Costa and Paiva, 1967
Costa and Paiva, 1968
Costa and Paiva, 1969
Costa and Paiva, 1970
Costa and Paiva, 1971
Ewald, Brandharst, Durant,
Espinosa, and Diaz, 1971
Fadul, 1968
Fonteles, A.A., Filho, 1968
Gesteira and Mesquita, 1973
Gines and Cervigon, 1968a
Gines, Cervigon, and Gomez,
1971
Griffiths, 1971
Griffiths and Simpson, 1972
Griffiths and Simpson, 1973
Lopez, 1972

Menezes, 1968
Paiva, 1968
Paiva, Bezerra, and Fonteles,
Filho 1971
Paiva and Cervigon, 1971
Paiva and Fonteles, Filho
1968
Paiva and Lima, 1963
Paiva and Nomura, 1965
Simpson and Griffiths, 1967
Simpson, Griffiths, and
Atiland, 1965
Vasil'ev and Torin, 1969

17a. Products

Bastos, Alves, Argripe, and
Telles, 1973
Fadul, 1968
Paiva and Costa, 1966

20. Miscellaneous

20a. Sample size required for
biological data acquisition

Albuquerque and Bezerra,
1968

20b. Flesh used to attract ants

Bastos, 1965a

20c. Data programming

Griffiths and Martinez,
1972

20d. Effects of rainfall, atmospheric
fronts, etc. on catch

Costa and Paiva, 1964
Costa and Paiva, 1965

King mackerel, Scomberomorus cavalla

1. Taxonomic identity

Bailey, Fitch, Herald, Lachner,
Lindsey, Robins, and Scott, 1970
Bauchot and Blanc, 1961
Beaumariage, 1973
Berrien and Finan, 1977
Breder, 1948
Collette, 1966
Cuvier, 1829
Cuvier and Valenciennes, 1831
Dahl, 1971
Dresslar and Fesler, 1889
Duarte-Bello and Buesa, 1973
Erdman, 1949
Evermann and Kendall, 1900
Evermann and Marsh, 1902
Fowler, 1905
Fowler, 1944
Fraser-Brunner, 1950
Hoese and Moore, 1972
Jordan and Evermann, 1896a
Jordan and Evermann, 1903
Jordan, Evermann, and Clark, 1930
Mago Leccia, 1958
Meek and Newland, 1885
Menezes, 1969a
Miyake and Hayasi, 1972
Nichols, 1929
Potombeira, Gomes, and Martins, 1973
Poey, 1875
Poey, 1878
Rivas, 1951
Shubnikov, 1974
Sumner, Osburn, and Cole, 1913b
Carson, 1944
Cervigon, 1966
Collette, Gibbs, and Buckow,
1965a
Cuvier and Valenciennes,
1831
Dalrymple, 1968
Dresslar and Fesler, 1889
Evermann and Marsh, 1902
Fowler, 1905
Fowler, 1944
Freeman and Walford, 1974
Freeman and Walford, 1976a
Freeman and Walford, 1976b
Freeman and Walford, 1976c
Goode, 1903
Herald, 1972
Hoese and Moore, 1972
Jordan, 1884
Jordan, 1905
Jordan and Evermann, 1896b
Jordan and Evermann, 1903
Jordan and Gilbert, 1882b
Jordan and Gilbert, 1882d
La Monte, 1951
La Monte, 1952a
La Monte, 1952b
Longley and Hildebrand,
1941
Magnuson, 1973
Meek and Hildebrand, 1923
Menezes, 1969a
Migdalski, 1958
Moe, 1970
Nichols, 1929
Nichols and Breder, 1927
Pew, 1954
Poey, 1868
Poey, 1875
Poey, 1878
Randall, 1968
Raney, 1954b
Rivas, 1951
Rose, 1968
Schroeder, 1924
Schwartz and Tyler, 1970
Smith, 1907
Walls, 1975

2. Physical description

Allyn, 1969
Bean, 1903
Bearden, 1961a
Beardsley and Richards, 1970
Beaumariage, 1973
Beebe and Hollister, 1935
Bigelow and Shroeder, 1953
Breder, 1948
Bright and Cashman, 1974
Butz and Mansueti, 1962

King mackerel, Scomberomorus cavalla

3. Distribution

Baughman, 1941
Baughman, 1950b
Bean, 1903
Bearden, 1961a
Beaumariage, 1970
Beaumariage, 1973
Berrien and Finan, 1977
Bigelow and Schroeder, 1953
Brice, 1898 b
Bright and Cashman, 1974
Butz and Mansueti, 1962
Cervigon, 1966
Collette, Gibbs, and Buckow,
1965a
Erdman, 1949
Erdman, 1956
Fowler, 1944
Goode, 1884
Heald, 1970
Henshall, 1895
Herald, 1972
Jordan and Evermann, 1896a
Jordan and Evermann, 1896b
Jordan and Evermann, 1903
Jordan, Evermann and Clark, 1930
Jordan and Gilbert, 1882d
La Monte, 1951
La Monte, 1952a
La Monte, 1952b
Longely and Hildebrand, 1941
Massmann, 1960
Mather, 1954
Mather and Day, 1954
Mather and Gibbs, 1957
Meek and Hildebrand, 1923
Moe, 1970
Moe, Heemstra, Tyler and
Wahlquist, 1966
Nichols, 1929
Nichols and Breder, 1927
Pew, 1954
Postel, 1955
Randall, 1968
Raney, 1954b
Robins, 1958
Schroeder, 1924
Shubnikov, 1974
Smith, 1907
Taylor, 1951

3a. Seasonal occurrence

Baughman, 1941
Beardsley and Richards,
1970
Bigelow and Schroeder,
1953
Breder, 1948
Carson, 1944
Costa and Paiva, 1965
Dalrymple, 1968
Evermann and Marsh, 1902
Filho, 1968
Gines, Cervigon, and Gomez,
1971
Jordan, 1884
La Monte, 1951
Moe, 1963
Nichols and Breder, 1927
Smith, 1907
Springer and Pirson, 1958
Springer and Woodburn, 1960
Swingle, 1971
Taylor, 1951

3b. Migration and tagging

Beaumariage, 1969
Beaumariage and Wittich,
1966
Migdalski, 1958
Moe, 1963
Moe, 1966
Moe, 1972
Springer and Woodburn, 1960

4. Anatomy and physiology

Alves, 1969
Alves and Tomé, 1966
Alves and Tomé, 1967a
Alves and Tomé, 1967b
Alves and Tomé, 1968b

Alves and Tomé, 1970
Beard, 1926
Coburn and Fischer, 1973
Cumming, 1967
Eisler, 1965

King mackerel, Scomberomorus cavalla

Anatomy and physiology
(Cont.)

Engle and Davis, 1964
Hinegardner and Rosen,
1972
Lee, Fisher, and Mar, 1973
Magnuson, 1973
Mago Leccia, 1958
Matsumura, Doherty, Furukawa,
and Boush, 1975
Menezes, 1969a
Pitombeira, Gomes, and Martins,
1973
Tamura and Wisby, 1963
Wittenberg and Haedrich,
1974

5. Parasites, diseases, and anomalies

Becker, 1970
Bere, 1936
Berrien and Finan, 1977
Bravo Hollis, 1953
Bravo Hollis and Deloya, 1973
Causey, 1953
Corkum, 1968
Hargis, 1956
Klein, 1973
Linton, 1897
Linton, 1901b
Nahhas and Cable, 1964
Parker, 1969
Pearse, 1949
Pearse, 1952
Silas, 1967
Silas and Ummerkutty, 1967
Sparks, 1958
Sumner, Osburn, and Cole,
1913b
Ward, 1954

6. Predators

Rose and Hassler, 1974
Tinsley, 1964

7. Habitat

Baughman, 1941
Dresslar and Fesler, 1889
Freeman and Walford, 1974
Freeman and Walford, 1976a
Freeman and Walford, 1976b
Freeman and Walford, 1976c
Jordan and Evermann, 1903
Lima and Paiva, 1966
Lowe, 1963
Moe, 1963
Randall, 1968
Raney, 1954b
Shubnikov, 1974
Wagner, 1973
Whiteleather and Brown,
1945

8. List of fishes

Bauchot and Blanc, 1961 (M)

8a. North America (general)

Briggs, 1958 (M)
Bullis and Thompson, 1965
Jordan, 1887
Moe, Heemstra, Tyler, and
Wahlquist, 1966 (M)
Powell, Dwinell, and Dwinell,
1972 (M)

New England

Mather, 1954
Mather and Gibbs, 1957
Smith, 1898
Sumner, Osburn, and Cole,
1913a
Sumner, Osburn, and Cole,
1913b

Mid-Atlantic (New York, New
Jersey, Delaware)

Latham, 1919

King mackerel, Scomberomorus cavalla

Chesapeake (Virginia,
Maryland)

McHugh, 1967
Massmann, 1960

South Atlantic

Bearden, 1961b
Dahlberg, 1972
Jordan and Gilbert,
1882a
Mahood, Harris, Music, and
Palmer, 1974a
Mahood, Harris, Music, and
Palmer, 1974b
Mahood, Harris, Music, and
Palmer, 1974c
Mahood, Harris, Music, and
Palmer, 1974d
Miller and Jorgenson, 1969
Struhsaker, 1969

Gulf

Breuer, 1962
Goode and Bean, 1882
Henshall, 1895
Hoese, 1958
Irby, 1974
Jordan, 1884
Jordan and Gilbert,
1882b
Juneau, 1975
Menzel, 1956
Perret, Latapie, Pollard,
Mock, Adkins, Gaidry, and
White, 1971
Roessler, 1970
Smith, Austin, Bortone,
Hastings, and Ogren, 1975
Springer and Bullis, 1956
Springer and Woodburn, 1960
Tabb and Manning, 1961
Thomas, Wagner, and Loesch,
1971
Wagner, 1973

8b. Central America and Caribbean

Beebe and Hollister, 1935
Caldwell, 1966
Jordan, 1886a
Jordan, 1886c
Jordan and Thompson,
1905
Meek and Hildebrand,
1923
Nichols, 1912
Poey, 1868
Poey, 1875
Poey, 1883
Wagner and Wolf, 1974
Zaneveld, 1962

8c. South America

Buen, 1972
Fowler, 1953
Gines and Cervigon,
1968b
Mago Leccia, 1970
Roux, 1963 (M)

9. Behavior

Dalrymple, 1968
La Monte, 1951
La Monte, 1952a
La Monte, 1952b
Longley and Hildebrand,
1941
Migdalski, 1958
Pew, 1954
Randall, 1968
Raney, 1954b
Shubnikov, 1974
Taylor, 1951
Whiteleather and Brown,
1945
Wicklund, 1969

King mackerel, Scomberomorus cavalla

10. Reproduction

Alcantara, P., Filho, 1972c
Alves and Tomé, 1967b
Alves and Tomé, 1968a
Baughman, 1941
Baughman, 1950b
Beaumariage, 1970
Beaumariage, 1973
Berrien and Finan, 1977
Breder, 1948
Christmas, Perry, and
Waller, 1974
Erdman, 1956
Erdman, 1976
Evermann and Marsh, 1902
Gorbunova and Salabarría,
1968
Ivo, 1972
Ivo, 1974
Moe, 1972
Swingle, 1971

12. Eggs and larvae

Beaumariage, 1970
Berrien and Finan, 1977
Christmas, Perry, and
Waller, 1974
Dwinell and Futch, 1973
Eldridge, Berry and
Miller, 1977
Gorbunova and Salabarría,
1968
Mayo, 1973
Powles and Stender, 1976
Richards and Klawe, 1972
Wollam, 1970

13. Juveniles

Bane, 1965
Beaumariage, 1970
Dwinell and Futch, 1973
Miller and Jorgenson, 1969
Nakamura, 1976
Wollam, 1970

14. Foods

Anderson and Gehringer,
1957a

Anderson and Gehringer,
1957b
Anderson and Gehringer,
1959a
Anderson and Gehringer,
1959b
Beaumariage, 1973
Berrien and Finan, 1977
Breder, 1948
Cervigon, 1966
Christmas, Perry, and
Waller, 1974
Claro, Radakov, Reshetnikov,
and Silva, 1974
DeVane, 1978 (In press)
Knapp, 1949
La Monte, 1952a
La Monte, 1952b
Linton, 1901b
Lowe, 1963
Menezes, 1969b
Nichols and Breder, 1927
Pew, 1954
Randall, 1967
Summer, Osburn, and Cole,
1913b

15. Age, growth, and mortality

Alcantara, P., Filho, 1972c
Beaumariage, 1970
Beaumariage, 1973
Costa and Almeida, 1974
(catch)
Costa and Paiva, 1966
(catch)
Costa and Paiva, 1967
(catch)
Costa and Paiva, 1968
(catch)
Costa and Paiva, 1969
(catch)
Costa and Paiva, 1970
(catch)
Costa and Paiva, 1971
(catch)
Ivo, 1974
Nomura and Rodrigues, 1967
Rodrigues and Bezerra, 1968

King mackerel, Scomberomorus cavalla

16. Length-weight relationships

Beardsley and Richards, 1970
Beaumariage, 1973
Nomura and Costa, 1966
Nomura and Costa, 1968

17. Commercial fishing

Alcantara, P., Filho, 1972c
Alexander, 1905a
Alexander, 1905b
Alexander, 1905c
Anderson and Gehringer, 1965
Anonymous, 1907
Baughman, 1949
Baughman, 1950a
Bean, 1903
Beaumariage, 1970
Beaumariage, 1973
Berrien and Finan, 1977
Brawner and Davis, 1974
Brice, 1898a
Carson, 1944
Cervigon, 1966
Cole, 1976
Collins and Smith, 1893
Collyer and Aguiar, 1972
Costa and Almeida, 1974
Costa and Paiva, 1963
Costa and Paiva, 1964
Costa and Paiva, 1965
Costa and Paiva, 1966
Costa and Paiva, 1967
Costa and Paiva, 1968
Costa and Paiva, 1969
Costa and Paiva, 1970
Costa and Paiva, 1971
Deuel, 1973
Deuel and Clark, 1968
Evermann, 1904
Fadul, 1968
Fielder, 1930
Fielder, 1931
Fielder, 1932
Fielder, 1933
Fielder, 1934
Fielder, 1936

Fielder, 1938
Fielder, 1939
Fielder, 1940
Fielder, 1941
Fielder, 1950
Fielder, Manning and
Thompson, 1936
Fonteles, A.A., Filho, 1968
Gesteira and Mesquita,
1973
Gines and Cervigon,
1968a
Gines, Cervigon and
Gomez, 1971
Goode, 1884
Griffiths, 1971
Griffiths and Simpson,
1972
Griffiths and Simpson,
1973
Gunter, 1967a
Hald, 1970
Henshall, 1895
Ingle, 1967 (Explor)
Juhl, 1974
La Monte, 1951
La Monte, 1952a
Lopez, 1972
McHugh, 1977
McHugh and Williams,
1976
Menezes, 1968
Mihara, Brito, Ramirez
and Salazar, 1971
Moe, 1963
Moe, 1970
Paiva, 1966
Paiva, 1968
Paiva, Bezerra and
Fonteles, Filho, 1971
Paiva and Cervigon,
1971
Paiva and Lima, 1966
Paiva and Menezes, 1967
Paiva and Muniz, 1964
Paiva and Nomura, 1965
Radcliffe, 1920
Radcliffe, 1921

King mackerel, Scomberomorus cavalla

Commercial fishing (Cont.)

- | | |
|--|---|
| Radcliffe, 1922 | Anderson and Gehringer,
1959a (Explor) |
| Radcliffe, 1923a | Anderson and Gehringer,
1959b (Explor) |
| Rivas, 1949 | Anderson and Gehringer,
1959c (Explor) |
| Robins, 1958 | Anderson and Gehringer, 1965 |
| Roithmayr, 1965 | Baughman, 1941 |
| Rounsefell, 1954 | Beaumariage, 1970 |
| Sal'nikov, 1969 | Beaumariage, 1973 |
| Schroeder, 1924 | Berrian and Finan, 1977 |
| Sette, 1926 | Buchanan, 1973 |
| Sette, 1927 | Buchanan, 1975 |
| Sette and Fielder, 1929 | Buchanan, Stone and Parker,
1974 |
| Simpson and Griffiths,
1967 | Clark, 1962 |
| Simpson, Griffiths and
Atiland, 1965 | Collette, Gibbs and Buckow,
1965a |
| Smith, 1907 | Dalrymple, 1968 |
| Suarez-Cabro and
Rolon, 1974 | De Sylva and Rathjen, 1961 |
| Swingle, 1971 | Deuel, 1973 |
| Taylor, Feigenbaum
and Sturza, 1973 | Deuel and Clark, 1968 |
| Townsend, 1900a | Ellis, 1957 |
| Townsend, 1900b | Evermann and Marsh, 1902 |
| Townsend, 1901a | Fable and Soloman, 1974 |
| Townsend, 1901b | Fielder and Jarvis, 1932 |
| Whiteleather and Brown,
1945 | Freeman and Walford, 1974 |
| Wilcox, 1904 | Freeman and Walford, 1976a |
| | Freeman and Walford, 1976b |
| | Freeman and Walford, 1976c |
| | Hammond, Myatt, and Cupka,
1977 |
| 17a. <u>Products</u> | Heald, 1970 |
| Bastos, Alves, Araripe
and Telles, 1973 | Holder, 1913 |
| Beard, 1926 | Jarvis, 1932 |
| Belloc, 1950 | Jordan and Evermann, 1903 |
| Collins, 1885 | Juhl, 1976 |
| Fadul, 1968 | Kruczynski, 1974 |
| Fielder, 1929a | La Monte, 1951 |
| Fielder, 1929b | La Monte, 1952a |
| Paiva and Costa, 1966 | Mather, 1952 |
| | Migdalski, 1958 |
| 18. <u>Recreational fishing</u> | |
| Allyn, 1969 | |
| Anderson and Gehringer,
1957a (Explor) | |
| Anderson and Gehringer,
1957b (Explor) | |

King mackerel, Scomberomorus cavalla

- Recreational fishing (Cont.)
- Moe, 1963
Moe, 1970
Nakamura and Rivas,
1974
Raney, 1954b
Rivas, 1949
Robins, 1958
Smith, 1907
Springer and Pirson,
1958
Sutherland, 1977
Taylor, 1951
Taylor, Feigenbaum,
and Sturza, 1973
Wagner and Wolf,
1974 (Explor)
Whiteleather and Brown,
1945
19. Manmade attractants or habitats
- Buchanan, 1973
Buchanan, 1975
Buchanan, Stone, and Parker,
1974
Hammond, Myatt, and Cupka,
1977
Hastings, Ogren, and Mabry,
1976
Wickham, Watson, and Ogren,
1973
20. Miscellaneous
- 20a. Stressed environment
- Breuer, 1962
Martin and Patus, 1974
- 20b. Hybrid
- De Sylva, 1954
- 20c. Effects of rainfall on
catch rates
- Costa and Paiva, 1964
Costa and Paiva, 1965
- 20d. Fish poisoning (in humans)
- Arcisz, 1950
Tybring, 1887
- 20e. Incidental to bait
- Bane, 1965
Mihara, Brito, Ramirez,
and Salazar, 1971
- 20f. Incidental to other
commercial species
- Keiser, 1976
Roithmayr, 1965
Siebenaler, 1952
- 20g. Sample size required for
biological data acquisition
- Albuquerque and Bezerra,
1968
- 20h. Data programming
- Bullis, Roe, and Gatlin,
1972
Griffiths and Martinez,
1972
- 20i. Population
- Juhl, 1976

Spanish mackerel, Scomberomorus maculatus

1. Taxonomic identity

Bailey, Fitch, Herald,
Lachner, Lindsey, Robins,
and Scott, 1970
Bauchot and Blanc, 1961
Breder, 1948
Cadenat, 1937
Cadenat, 1950
Chabanaud and Monod, 1926
Cuvier and Valenciennes, 1831
Dresslar and Fesler, 1889
Duarte-Bello and Buesa, 1973
Erdman, 1949
Evermann and Kendall, 1900
Evermann and Marsh, 1902
Fowler, 1936
Fowler, 1944
Fowler, 1945
Fraser-Brunner, 1950
Goode, 1903
Hildebrand and Schroeder,
1927
Hoese and Moore, 1977
Jordan and Evermann, 1896a
Jordan and Evermann, 1903
Jordan, Evermann, and Clark,
1930
Klima, 1959
Mago Leccia, 1958
Marquez, 1973
Mather and Day, 1954
Meek and Newland, 1885
Mitchill, 1815
Miyake and Hayasi, 1972
Navarro, 1943
Nichols, 1929
Poey, 1878
Postel, 1950
Rivas, 1951
Scaccini, 1941
Shubnikov, 1974
Storer, 1853
Sumner, Osburn and Cole,
1913b
Uhler and Lugger, 1876

2. Physical description

Allyn, 1969
Anonymous, 1969
Anonymous, 1971
Bean, 1903
Bearden, 1961a
Beardsley and Richards,
1970
Beebe and Tee-Van, 1938
Beebe and Tee-Van, 1970
Bigelow and Schroeder,
1953
Bigelow and Welsh, 1925
Breder, 1948
Brice, 1898b
Carson, 1944
Collette, Gibbs, and
Buckow, 1965b
Cuvier and Valenciennes,
1831
Dalrymple, 1968
Dresslar and Fesler, 1889
Earll, 1883
Erdman, 1971
Evermann and Marsh, 1902
Fowler, 1944
Fowler, 1945
Freeman and Walford, 1974
Freeman and Walford, 1976a
Freeman and Walford, 1976b
Freeman and Walford, 1976c
Goode, 1884
Goode, 1903
Herald, 1972
Hildebrand and Cable, 1938
Hildebrand and Schroeder,
1927
Hoese and Moore, 1977
Jordan, 1905

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Physical description (Cont.)

Jordan and Evermann, 1896b
Jordan and Evermann, 1903
Jordan and Gilbert, 1882d
La Monte, 1952a
La Monte, 1952b
Leim and Scott, 1966
Longely and Hildebrand, 1941
Lyles, 1969
Magnuson, 1973
Marquez, 1973
Mather and Day, 1954
Migdalski, 1958
Mitchell, 1815
Moe, 1970
Nichols, 1929
Nichols and Breder, 1927
Pew, 1954
Poey, 1878
Randall, 1968
Raney, 1954c
Rivas, 1951
Rose, 1968
Schroeder, 1924
Schwartz and Tyler, 1970
Smith, H.M., 1907
Smith, J.L.B., 1953
Storer, 1853
Taylor, 1951
Uhler and Lugger, 1876
Walls, 1975

Bigelow and Welsh, 1925
Brice, 1898b
Campillo Sainz, 1976
Carson, 1944
Collette, Gibbs, and
Buckow, 1965b
Duarte-Bello and Buesa, 1971
Earll, 1883
Erdman, 1949
Erdman, 1956
Fowler, 1944
Goode, 1884
Goode, 1903
Heald, 1970
Henshall, 1895
Herald, 1972
Jordan and Evermann, 1896a
Jordan and Evermann, 1896b
Jordan and Evermann, 1903
Jordan, Evermann, and
Clark, 1930
Jordan and Gilbert, 1882d
Klima, 1959
La Monte, 1952a
La Monte, 1952b
Longley and Hildebrand,
1941
Lozano Cabo, 1970
Lyles, 1969
Marquez, 1973
Mather and Day, 1954
Moe, 1970
Moe, Heemstra, Tyler, and
Wahlquist, 1966
Nichols, 1929
Nichols and Breder, 1927
Pew, 1954
Pillay, 1967
Postel, 1955
Randall, 1968
Raney, 1954c
Robins, 1958

3. Distribution

Anonymous, 1969
Baird, 1889
Baughman, 1941
Baughman, 1947
Baughman, 1950b
Bean, 1903
Bearden, 1961a
Beaumariage, 1970
Beebe and Tee-Van, 1938
Beebe and Tee-Van, 1970
Bigelow and Schroeder, 1953

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Distribution (Cont.)

Rochebrune, 1883
Schroeder, 1924
Shubnikov, 1974
Smith, H.M., 1907
Smith, J.L.B., 1953
Storer, 1853
Taylor, 1951
Tracy, 1909

3a. Seasonal occurrence

Baughman, 1941
Beardsley and Richards, 1970
Bigelow and Schroeder, 1953
Bigelow and Welsh, 1925
Breder, 1948
Cain and Dean, 1976
Carson, 1944
Dalrymple, 1968
Earll, 1883
Franks, Christmas, Silver,
Combs, Waller, and Burns,
1972
Goode, 1884
Goode, 1903
Gunter, 1945
Hickey, Sosnow, and Lester, 1975
Hildebrand and Cable, 1938
Hildebrand and Schroeder, 1927
Jordan and Evermann, 1903
Mendoza, 1968
Mitchell, 1815
Moe, 1963
Nichols and Breder, 1927
Smith, 1907
Springer and Pirson, 1958
Springer and Woodburn, 1960
Swingle, 1971
Tracy, 1909

3b. Migrations and tagging

Baird, 1889
Beaumariage, 1969
Beaumariage and
Wittich, 1966
Earll, 1883
Goode, 1884
Hildebrand and Schroeder,
1927
Klima, 1959
Mendoza, 1968
Migdalski, 1958
Moe, 1963
Moe, 1972
Randall, 1968
Taylor, 1951
Tracy, 1909

4. Anatomy and physiology

Atwater, 1885
Atwater, 1892
Bauer and Eitenmiller,
1974
Beard, 1926
Becker, Bird, Kelly,
Schilling, Solomon
and Young, 1958
Chaine, 1957
Coburn and Fischer, 1973
Edmunds and Eitenmiller,
1975
Eisler, 1965
Engel and Davis, 1964
Fish and Mowbry, 1970

Spanish mackerel, Scomberomorus maculatus

Anatomy and physiology (Cont.)

Frost, 1938
Gray, 1954
Hinegardner and Rosen,
1972
Hughes, 1966
Magnuson, 1973
Matsumura, Doherty, Fur-
ukawa and Boush, 1975
Mago Leccia, 1958
Muir, 1969
Sanz Echeverria, 1950
Windom, Stickney, Smith,
White and Taylor, 1973

5. Parasites, diseases, and anomalies

Brown, 1971
Causey, 1953
Comeaux, 1942
Corkum, 1959
Corkum, 1968
Cressey, 1975
Hargis, 1956
Iversen and Van Meter,
1967
Kensley and Grindley,
1973
Klein, 1973
Koratha, 1955a
Koratha, 1955b
Linton, 1897
Linton, 1901b
Linton, 1905
Linton, 1940
Lom, 1970
Nahas and Short,
1965
Nakamura and Yuen,
1961
Nigrelli and Stunkard,
1947
Overstreet, 1969
Parker, 1969

Pearse, 1951
Pearse, 1952
Silas, 1967
Silas and Ummerkutty,
1967
Sindermann, 1970
Sparks, 1958
Sproston, 1946
Summer, Osburn and
Cole, 1913b

6. Predators

Carlson, 1952
Dragovich, 1969
Rose and Hassler, 1974
Tinsley, 1964

7. Habitat

Anonymous, 1971
Burns, 1970
Dahlberg, 1972
Dresslar and Fesler,
1889
Dunham, 1972
Fontenot and Rogillio,
1970
Franks, Christmas, Siler,
Combs, Waller and Burns,
1972
Freeman and Walford,
1974

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Habitat (Cont.)

Freeman and Walford, 1976a
Freeman and Walford, 1976b
Freeman and Walford, 1976c
Goode, 1884
Gunter, 1945
Gunter, 1967a
Hildebrand, 1954
Hildebrand, 1955
Hildebrand and Cable, 1938
Lindall, 1973
Massmann, 1962
Navarro, 1943
Randall, 1968
Raney, 1954c
Robins, 1971
Rounsefell, 1954
Shubnikov, 1974
Tagatz, 1967
Tagatz and Dudley, 1961
Tagatz and Wilkens, 1973
Thomas, Wagner, and Loesch,
1971
Tracy, 1909
Turner and Johnson, 1973
Wagner, 1973
Whiteleather and Brown,
1945

8. List of fishes

Bauchot and Blanc, 1961 (M)

8a. North America (general)

Bean, 1880 (M)
Briggs, 1958 (M)
Bullis and Thompson, 1965
Gill, 1878
Jordan, 1887
Moe, Heemstra, Tyler, and
Wahlquist, 1966 (M)
Powell, Dwinell, and Dwinell,
1972 (M)

New England

Arnold, 1951
Smith, 1898
Sumner, Osburn, and
Cole, 1913a
Sumner, Osburn, and
Cole, 1913b

Mid-Atlantic

Bean, 1888

Chesapeake

Fowler, 1927
McHugh, 1967
Massmann, 1962
Smith, 1892

South Atlantic

Anderson, 1968
Anderson, Dias, Dias,
Cupka, and Chamberlain, 1977
Bearden, 1961b
Cain and Dean, 1976
Dahlberg, 1972
Evermann and Bean, 1898
Hoese, 1973
Jenkins, 1887
Jordan, 1886b
Jordan and Gilbert, 1878
Jordan and Gilbert, 1882a
Lunz and Schwartz, 1970
Mahood, Harris, Music,
and Palmer, 1974a
Mahood, Harris, Music,
and Palmer, 1974b
Mahood, Harris, Music,
and Palmer, 1974c
Mahood, Harris, Music,
and Palmer, 1974d

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South Atlantic (Cont.)

Miller and Jorgenson, 1969
Struhsaker, 1969
Tagatz, 1967
Tagatz and Dudley, 1961
Turner and Johnson, 1973

Gulf of Mexico

Breuer, 1961-1962
Breuer, 1962
Bryan, 1971
Burns, 1970
Copeland, 1965
Fontenot and Rogillio, 1970
Franks, Christmas, Siler,
Combs, Waller, and Burns,
1972
Gunter, 1945
Henshall, 1891
Henshall, 1895
Hildebrand, 1954
Hildebrand, 1955
Hoese, 1958
Irby, 1974
Jordan, 1884
Jordan and Gilbert, 1882b
Joseph and Yerger, 1956
Juneau, 1975
Kelly, 1965
McFarland, 1963
May, Trent, and Pristas, 1976
Menzel, 1956
Mountain, 1972
Parker, 1965
Perret and Caillouet, 1974
Perret, Latapie, Pollard,
Mock, Adkins, Gaidry,
and White, 1971
Reid, 1954
Reid, 1956
Reid, 1957

Richmond, 1968
Simmons, 1957
Springer and Bullis, 1956
Springer and Woodburn, 1960
Sykes and Finucane, 1966
Tabb and Manning, 1961
Tagatz and Wilkens, 1973
Thomas, Wagner, and
Loesch, 1971
Wagner, 1973

8b. Central America and Caribbean

Caldwell, 1966
Jordan, 1886a
Jordan and Gilbert, 1883
Jordan and Thompson, 1905
Leon, 1973
Wagoner and Wolf, 1974
Zaneveld, 1962

8d. Africa

Cadenat, 1937
Lozano Cabo, 1950
Lozano Cabo, 1970
Navarro, 1943
Osorio, 1898 (M)
Pillay, 1967

9. Behavior

Dalrymple, 1968
Drennan and Bullis, 1971

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Behavior (Cont.)

Goode, 1884
Goode, 1903
Jordan, 1905
La Monte, 1951
La Monte, 1952a
La Monte, 1952b
Longley and Hildebrand, 1941
Lyles, 1969
Migdalski, 1958
Pew, 1954
Randall, 1968
Roithmayr, 1970
Shubnikov, 1974
Smiley, 1885
Taylor, 1951
Whiteleather and
Brown, 1945

10. Reproduction

Baughman, 1950b
Bean, 1903
Beaumariage, 1970
Breder, 1948
Brice, 1898b
Carson, 1944
Christmas, Perry, and
Waller, 1974
Earll, 1883
Earll, 1884
Goode, 1884
Goode, 1903
Gorbunova and Salabarría,
1968
Hildebrand and Cable, 1938
Hildebrand and Schroeder,
1927
Jordan and Evermann,
1903
Klima, 1959
Marquez, 1973
Moe, 1972
Navarro, 1943
Nichols and Breder,
1927

Powell, 1975
Ryder, 1881
Smiley, 1881
Swingle, 1971
Taylor, 1951
Tracy, 1909
Vasconcelos Pérez, 1976
Verrill, 1880

11. Artificial propagation

Brice, 1898b
Earll, 1883
Earll, 1884
Kite, 1885
Smiley, 1881
Verrill, 1880
Wood, 1885

12. Eggs and larvae

Beaumariage, 1970
Christmas, Perry, and
Waller, 1974
Dwinell and Futch, 1973
Earll, 1883
Gorbunova and Salabarría,
1968
Hildebrand and Cable,
1938
Mayo, 1973
Nichols and Breder, 1927
Page, 1890
Powles and Stender, 1976
Richards and Klawe, 1972
Ryder, 1881
Ryder, 1887
Smiley, 1881
Smiley, 1887
Tracy, 1907
Verrill, 1880
Wollam, 1970

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13. Juveniles

Anderson, Dias, Dias,
Cupka and Chamberlain,
1977
Baughman, 1947
Beaumariage, 1970
Breuer, 1961-1962
Cain and Dean, 1976
Dwinell and Futch, 1973
Fagade and Olaniyan,
1973
Fahy, 1975
Grimes, 1971
Joseph and Yerger, 1956
Kelly, 1965
Miller and Jorgenson, 1969
Nakamura, 1976
Reid, 1956
Reid, 1957
Sabins and Truesdale, 1974
Springer and Woodburn, 1960
Sykes, 1964
Sykes and Finucane, 1966
Wollam, 1970

Knapp, 1949
La Monte, 1952a
La Monte, 1952b
Pew, 1954
Sumner, Osburn, and
Cole, 1913b

14. Foods

Anderson and Gehringer,
1957b
Anderson and Gehringer,
1959a
Beebe and Tee-Van, 1938
Breder, 1948
Carson, 1944
Christmas, Perry, and
Waller, 1974
Earll, 1883
Fagade and Olaniyan,
1973
Goode, 1884
Goode, 1903
Jordan and Evermann,
1903
Klima, 1959

15. Age, growth, and mortality

Beaumariage, 1970
Klima, 1959
Klima, 1976
Marquez, 1973
Powell, 1975
Rodrigues and Bezerra,
1968

16. Length-weight relationships

Beardsley and Richards, 1970
Christmas, Perry, and Waller,
1974
Jorgenson and Miller, 1968
Klima, 1959

Spanish mackerel, Scomberomorus maculatus

17. Commercial fishing

- Alexander, 1905a
 Alexander, 1905b
 Alexander, 1905c
 Anderson and Gehringer, 1965
 Anonymous, 1907
 Anonymous, 1971
 Baird, 1889
 Baughman, 1949
 Baughman, 1950a
 Bean, B.A., 1892
 Bean, 1903
 Beaumariage, 1970
 Beebe and Tee-Van, 1938
 Brawner and Davis, 1974
 Brice, 1898a
 Brice, 1898b
 Carson, 1944
 Collins, 1887
 Collins, 1892
 Collins and Smith, 1892
 Collins and Smith, 1893
 Dunham, 1972
 Earll, 1883
 Earll, 1887
 Escudero González, 1976
 Evermann, 1904
 Evermann and Bean, 1898
 Fiedler, 1930
 Fiedler, 1931
 Fiedler, 1932
 Fiedler, 1933
 Fiedler, 1934
 Fiedler, 1936
 Fiedler, 1938
 Fiedler, 1939
 Fiedler, 1940
 Fiedler, 1941
 Fiedler, 1950
 Fiedler, Manning and
 Johnson, 1936
 Florida Department of Natural
 Resources, 1959
 Franks, Christmas, Siler,
 Combs, Waller, and
 Burns, 1972
 Goode, 1884
 Goode, 1887
 Goode, 1903
 Gunter, 1967a
 Heald, 1970
 Henshall, 1895
 Higgins and Lord, 1927
 Higgins and Pearson, 1928
 Hildebrand and Schroeder,
 1927
 Juhl, 1974
 Juhl, 1976
 Klima, 1959
 Klima, 1976
 La Monte, 1952a
 Lindall, 1973
 Lyles, 1969
 McHugh, 1975
 McHugh, 1977
 McHugh and Williams, 1976
 Márquez, 1973
 May, Trent, and Pristas,
 1976
 Mihara, Brito, Ramirez,
 and Salazar, 1971
 Moe, 1963
 Moe, 1970
 Navarro, 1943
 Radcliffe, 1921
 Radcliffe, 1922
 Radcliffe, 1923a
 Radcliffe, 1923b
 Rivas, 1949
 Robins, 1958
 Roithmayr, 1965
 Rousenfell, 1954
 Sal'nikov, 1969
 Schroeder, 1924
 Sette, 1926
 Sette, 1927
 Sette, 1928
 Sette and Fiedler, 1929
 Smith, 1892
 Smith, 1893
 Smith, 1894a
 Smith, 1895
 Smith, 1896
 Smith, 1907

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Commercial fishing (Cont.)

Stevenson, 1893
Swingle, 1971
Taylor, 1924
Taylor, Feigenbaum, and
Sturza, 1973
Townsend, 1900a
Townsend, 1900b
Townsend, 1901a
Townsend, 1901b
Whiteleather, and
Brown, 1945
Wilcox, 1898
Wilcox, 1904
Wolf, 1974 (Explor)
Wolf and Rathjen,
1974 (Explor)

Clark, 1962
Collette, Gibbs, and
Buckow, 1965b
Dalrymple, 1968
Deuel, 1973
Deuel and Clark, 1968
Ellis, 1957
Fable and Saloman, 1974
Fiedler and Jarvis, 1932
Freeman and Walford, 1974
Freeman and Walford, 1976a
Freeman and Walford, 1976b
Freeman and Walford, 1976c
Goode, 1884
Goode, 1903
Gordon, 1960
Hammond, Myatt, and Cupka, 1977
Heald, 1970
Holder, 1913
Jarvis, 1932
Juhl, 1976
Klima, 1959
Kruczynski, 1974
La Monte, 1952a
Mather, 1952
Migdalski, 1958
Moe, 1963
Moe, 1970
Nakamura and Rivas, 1974
Raney, 1954c
Robins, 1958
Smith, H.M., 1907
Smith, J.L.B., 1953
Springer and Pirson, 1958
Sutherland, 1977
Taylor, Feigenbaum, and
Sturza, 1973
Wagner and Wolf, 1974
(Explor)
Whiteleather and Brown, 1945
Wilcox, 1902

17a. Products

Anonymous, 1971
Atwater, 1885
Atwater, 1892
Beard, 1926
Deng, Toledo, and
Lillard, 1974
Edmunds and Eitenmiller, 1975
Farragut, 1972
Fiedler, 1929a
Fiedler, 1929b
Fiedler and Matthews, 1926
López and Okuda, 1965
Lyles, 1969

18. Recreational fishing

Allyn, 1969
Anderson and Gehringer,
1957b (Explor)
Anderson and Gehringer,
1959a (Explor)
Anderson and Gehringer,
1965
Beaumariage, 1970
Buchanan, 1973
Buchanan, 1975
Buchanan, Stone, and
Parker, 1974

19. Man made attractants or habitats

Buchanan, 1973
Buchanan, 1975
Buchanan, Stone, and Parker,
1974
Hammond, Myatt, and Cupka, 1977

Spanish mackerel, Scomberomorus maculatus

20. Miscellaneous

20a. Hybrid

De Sylva, 1954

20b. School detection

Drennan and Bullis, 1971
Roithmayr, 1970

20c. Stressed or altered environment

Breuer, 1961-1962
Breuer, 1962
Grimes, 1971
Gunter, 1967b
Lindall, 1973
Martin and Patus, 1974
McHugh, 1975
Mountain, 1972
Simmons, 1957

20d. Data programming

Bullis, Roe, and Gatlin, 1972

20e. Incidental to other commercial species

Anderson, 1968
Burns, 1970
Christmas, Gunter, and
Whatley, 1960
Hickey, Sosnow, and
Lester, 1975
Keiser, 1976
Roithmayr, 1965
Siebenaler, 1952

20f. Effects of rainfall, atmospheric
fronts, etc. on catch

May, Trent, and Pristas,
1976

20g. Population

Juhl, 1976
McFarland, 1963
Márquez, 1973

20h. Bait to catch other species

Kawaguchi, 1974
Wolf and Chislett, 1974

20i. Attacking humans

Helm, 1976

Cero, Scomberomorus regalis

1. Taxonomic identity

Bailey, Fitch, Herald,
Lachner, Lindsey, Robins,
and Scott, 1970
Bauchot and Blanc, 1961
Bloch, 1793
Breder, 1948
Collette, 1966
Cuvier and Valenciennes,
1831
Dahl, 1971
Dresslar and Fesler, 1889
Duarte - Bello and Buesa,
1973
Erdman, 1949
Evermann and Kendall,
1900
Evermann and Marsh,
1902
Fowler, 1905
Fowler, 1944
Fowler, 1945
Fraser - Brunner, 1950
Hildebrand and Schroeder, 1927
Hoese and Moore, 1977
Jordan, 1963
Jordan and Evermann, 1896a
Jordan and Evermann, 1903
Jordan, Evermann, and Clark,
1930
Kner, 1865
Lacépède, 1802
Mago, Leccia, 1958
Meek and Newland, 1885
Miyake and Hayasi, 1972
Nichols, 1929
Poey, 1875
Poey, 1878
Rivas, 1951
Shubnikov, 1974
Sumner, Osburn, and Cole, 1913b
Uhler and Lugger, 1876

2. Physical description

Anonymous, 1969
Bean, 1903
Beardsley and Richards,
1970
Beebe and Hollister, 1935
Beebe and Tee-Van, 1928
Bigelow and Schroeder, 1953
Bigelow and Welsh, 1925
Bloch, 1793
Bloch and Schneider, 1801
Bohlke and Chaplin, 1968
Breder, 1948
Carson, 1944
Cervigon, 1966
Collette and Gibbs, 1965
Cuvier and Valenciennes,
1831
Dalrymple, 1968
Dresslar and Fesler, 1889
Erdman, 1971
Evermann and Marsh, 1902
Fowler, 1905
Fowler, 1944
Fowler, 1945
Freeman and Walford,
1976c
Goode, 1903
Herald, 1972
Hildebrand and Schroeder,
1927
Hoese and Moore, 1977
Jordan, 1884
Jordan, 1905
Jordan and Evermann, 1896b
Jordan and Evermann, 1903

Cero, Scomberomorus regalis

Physical description (Cont.)

Jordan and Gilbert, 1882d
Kner, 1865
La Monte, 1952a
La Monte, 1952b
Longley and Hildebrand,
1941
Magnuson, 1973
Meek and Hildebrand, 1923
Migdalski, 1958
Moe, 1970
Nichols, 1929
Nichols and Breder, 1927
Pew, 1954
Poey, 1868
Poey, 1875
Poey, 1878
Randall, 1968
Raney, 1954a
Rivas, 1951
Rose, 1968
Schroeder, 1924
Smith, 1907
Walls, 1975

Herald, 1972
Hildebrand and Schroeder, 1927
Jordan and Evermann, 1896a
Jordan and Evermann, 1896b
Jordan and Evermann, 1903
Jordan, Evermann, and Clark, 1930
Jordan and Gilbert, 1882d
LaMonte, 1952a
LaMonte, 1952b
Longley and Hildebrand,
1941
Lyles, 1969
Meek and Hildebrand,
1923
Moe, 1970
Moe, Heemstra, Tyler, and
Wahlquist, 1966
Nichols, 1929
Nichols and Breder, 1927
Pew, 1954
Postel, 1955
Randall, 1968
Raney, 1954a
Robins, 1958
Schroeder, 1924
Shubnikov, 1974
Smith, 1907
Tracy, 1909
Wollam, 1970

3. Distribution

Anonymous, 1969
Baird, 1889
Baughman, 1941
Baughman, 1950b
Bean, 1903
Beebe and Tee-Van, 1938
Bigelow and Schroeder, 1953
Bigelow and Welsh, 1925
Bohlke and Chaplin, 1968
Brice, 1898b
Butz and Mansueti, 1962
Cervigon, 1966
Collette and Gibbs, 1965
Duarte-Bello and Buesa, 1973
Erdman, 1949
Erdman, 1956
Fowler, 1944
Goode, 1884
Goode, 1903
Henshall, 1895

Cero, Scomberomorus regalis

3a. Seasonal occurrence

Beardsley and Richards, 1970
Bigelow and Schroeder, 1953
Bigelow and Welsh, 1925
Breder, 1948
Dalrymple, 1968
Gordon, 1960
Nichols and Breder, 1927
Raney, 1954a
Smith, 1907
Tracy, 1909

3b. Migrations and tagging

Baird, 1889
Beaumariage, 1969
Migdalski, 1958

4. Anatomy and physiology

Carey, Teal, Kanwisher,
Lawson, and Beckett, 1971
Fish and Mowbray, 1970
Frost, 1928
Magnuson, 1973
Mago Leccia, 1958
Saunders, 1966
Swarts, 1969

5. Parasites, diseases and anomalies

Becker, 1970
Cressey, 1975
Linton, 1897
Linton, 1901a
Linton, 1901b
Linton, 1905
Linton, 1907
Manther, 1940
Manther, 1947
Manther, 1954
Overstreet, 1969
Silas, 1967
Silas and Ummerkutty, 1967
Sumner, Osburn, and
Cole, 1913b
Ward, 1954

6. Predators

Beardsley, Merrett, and
Richards, 1975
Tinsley, 1964
Voss, 1953

7. Habitat

Dresslar and Fesler, 1889
Freeman and Walford, 1976c
Randall, 1968
Raney, 1954a
Shubnikov, 1974
Taylor, Bigelow, and
Graham, 1957

8. Lists of fishes

Bauchot and Blanc, 1961 (M)

8a. North America (general)

Briggs, 1958 (M)
Bullis and Thompson, 1965
Gill, 1878
Jordan, 1887
Moe, Heemstra, Tyler, and
Wahlquist, 1966 (M)
Powell, Dwinell, and
Dwinell, 1972 (M)

Cero, Scomberomorus regalis

New England

Smith, 1898
Sumner, Osburn, and
Cole, 1913a
Sumner, Osburn, and
Cole, 1913b

Mid-Atlantic (New York,
New Jersey, and Delaware)

Latham, 1918

Chesapeake (Virginia and
Maryland)

Truitt, Bean, and Fowler, 1929
Uhler and Lugger, 1876

South Atlantic

Bearden, 1961b
Jenkins, 1887
Jordan and Gilbert, 1878

Gulf of Mexico

Goode and Bean, 1882
Henshall, 1895
Hoese, 1958
Jordan, 1884
Springer and Bullis, 1956

8b. Central America and Caribbean

Beebe and Hollister, 1935
Fowler, 1915
Jordan, 1886a
Jordan, 1886c
Meek and Hildebrand, 1923
Nichols, 1912
Poey, 1868
Poey, 1875
Zaneveld, 1962

8c. South America

Buen, 1972
Fowler, 1953
Mago Leccia, 1970
Roux, 1963 (M)

9. Behavior

Dalrymple, 1968
LaMonte, 1951
LaMonte, 1952a
Longley and Hildebrand, 1941
Migdalski, 1958
Pew, 1954
Randall, 1968
Raney, 1954a
Shubnikov, 1974
Starck and Davis, 1966
Taylor, 1951

10. Reproduction

Baughman, 1950b
Breder, 1948
Erdman, 1956
Erdman, 1976
Gorbunova and Salabarría, 1968

12. Eggs and larvae

Gorbunova and Salabarría, 1968
Powles and Stender, 1976
Richards and Klawe, 1972

13. Juveniles

Bane, 1965
Hubbs, 1936

Cero, Scomberomorus regalis

14. Foods and feeding
 Anderson and Gehringer, 1959b
 Beebe and Tee-Van, 1938
 Breder, 1948
 Cervigon, 1966
 LaMonte, 1952a
 Linton, 1901b
 Nichols and Breder, 1927
 Pew, 1954
 Randall, 1967
 Sumner, Osburn, and Cole, 1913b
 Tracy, 1909
16. Length-weight relationships
 Beardsley and Richards, 1970
17. Commercial fishing
 Adams and Kendall, 1891
 Alexander, 1905c
 Baird, 1889
 Bean, 1903
 Cervigon, 1966
 Cole, 1976
 Collins and Smith, 1893
 Fiedler, 1930
 Fiedler, 1931
 Fiedler, 1932
 Fiedler, 1933
 Fiedler, 1934
 Fiedler, 1936
 Fiedler, 1938
 Fiedler, 1939
 Fiedler, 1940
 Fiedler, 1941
 Fiedler, 1950
 Fiedler, Manning, and Johnson, 1936
 Gunter, 1967a
 Henshall, 1895
 LaMonte, 1952a
- Lyles, 1969
 McHugh and Williams, 1976
 Moe, 1963
 Moe, 1970
 Paiva and Nomura, 1965
 Radcliffe, 1921
 Radcliffe, 1922
 Rivas, 1949
 Robins, 1958
 Sal'nikov, 1969
 Schroeder, 1924
 Sette, 1926
 Sette, 1927
 Simpson and Griffiths, 1967
 Simpson, Griffiths, and Atiland, 1965
 Smith, 1894a
 Smith, 1895
 Smith, 1896
 Smith, 1907
 Suarez-Cabro and Rolon, 1970
 Taylor, 1924
- 17a. Products
 Fiedler, 1929a
 Fiedler, 1929b
 Fiedler, and Matthews, 1926
 Lyles, 1969
 Paiva and Costa, 1966
18. Recreational fishing
 Anderson and Gehringer, 1959b (Explor)
 Buchanan, 1973
 Clark, 1962

Cero, Scomberomorus regalis

14. Foods and feeding
 Anderson and Gehringer, 1959b
 Beebe and Tee-Van, 1938
 Breder, 1948
 Cervigon, 1966
 LaMonte, 1952a
 Linton, 1901b
 Nichols and Breder, 1927
 Pew, 1954
 Randall, 1967
 Sumner, Osburn, and Cole, 1913b
 Tracy, 1909
16. Length-weight relationships
 Beardsley and Richards, 1970
17. Commercial fishing
 Adams and Kendall, 1891
 Alexander, 1905c
 Baird, 1889
 Bean, 1903
 Cervigon, 1966
 Cole, 1976
 Collins and Smith, 1893
 Fiedler, 1930
 Fiedler, 1931
 Fiedler, 1932
 Fiedler, 1933
 Fiedler, 1934
 Fiedler, 1936
 Fiedler, 1938
 Fiedler, 1939
 Fiedler, 1940
 Fiedler, 1941
 Fiedler, 1950
 Fiedler, Manning, and Johnson, 1936
 Gunter, 1967a
 Henshall, 1895
 LaMonte, 1952a
- Lyles, 1969
 McHugh and Williams, 1976
 Moe, 1963
 Moe, 1970
 Paiva and Nomura, 1965
 Radcliffe, 1921
 Radcliffe, 1922
 Rivas, 1949
 Robins, 1958
 Sal'nikov, 1969
 Schroeder, 1924
 Sette, 1926
 Sette, 1927
 Simpson and Griffiths, 1967
 Simpson, Griffiths, and Atiland, 1965
 Smith, 1894a
 Smith, 1895
 Smith, 1896
 Smith, 1907
 Suarez-Cabro and Rolon, 1970
 Taylor, 1924
- 17a. Products
 Fiedler, 1929a
 Fiedler, 1929b
 Fiedler, and Matthews, 1926
 Lyles, 1969
 Paiva and Costa, 1966
18. Recreational fishing
 Anderson and Gehringer, 1959b (Explor)
 Buchanan, 1973
 Clark, 1962

Recreational fishing (Cont.)

Dalrymple, 1968
Deuel, 1973
Deuel and Clark, 1968
Freeman and Walford,
1976c
LaMonte, 1952a
Mather, 1952
Migdalski, 1958
Moe, 1963
Moe, 1970
Raney, 1954a
Rivas, 1949
Robins, 1958
Smith, 1907
Wagner and Wolf,
1974 (Explor)

19. Manmade attractants or habitats

Buchanan, 1973

20. Miscellaneous

20a. Fish kills

Taylor, 1919

20b. Stressed environment (includes
alterations, hypersalinity,
heated effluent)

Martin and Patus, 1974

20c. Fish poisoning in humans

Arcisz, 1950

20d. Caught incidental to bait

Bane, 1965

20e. Computer programming

Bullis, Roe, and
Gatlin, 1972

Scomberomorus sp.

1. Taxonomic identity

Collette and Gibbs, 1963
Conrad, 1938
Fowler, 1936
Goode and Bean, 1895
Jordan, 1923
Jordan, 1963
Jordan and Gilbert,
1882c
Mago Leccia, 1958
Nelson, 1976
Postel, 1955
Postel, 1966
Starks, 1910
Zharov, 1967

2. Physical description

Goode and Bean, 1895

4. Anatomy and physiology

Conrad, 1938
Gregory, 1933
Mago Leccia, 1958
Rivas, 1953
Starks, 1910

5. Parasites, diseases, and anomalies

Bravo Hollis, 1953
Bravo Hollis, and
DeLOYA, 1973
Siddiqi and Cable, 1960

6. Predators

Klawe, 1961

12. Eggs and larvae

Compton, 1964

13. Juveniles

Klawe, 1961

17. Commercial fishing

Paiva and Mota, 1961
Wolf and Rathjen,
1974 (Explor)

17a. Products

Caland, Viera, and Monteiro,
1968
Viera and Caland, 1968

Recreational fishing (Cont.)

Dalrymple, 1968
Deuel, 1973
Deuel and Clark, 1968
Freeman and Walford,
1976c
LaMonte, 1952a
Mather, 1952
Migdalski, 1958
Moe, 1963
Moe, 1970
Raney, 1954a
Rivas, 1949
Robins, 1958
Smith, 1907
Wagner and Wolf,
1974 (Explor)

19. Manmade attractants or habitats

Buchanan, 1973

20. Miscellaneous

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20b. Stressed environment (includes alterations, hypersalinity, heated effluent)

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Collette and Gibbs, 1963
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Jordan, 1963
Jordan and Gilbert,
1882c
Mago Leccia, 1958
Nelson, 1976
Postel, 1955
Postel, 1966
Starks, 1910
Zharov, 1967

2. Physical description

Goode and Bean, 1895

4. Anatomy and physiology

Conrad, 1938
Gregory, 1933
Mago Leccia, 1958
Rivas, 1953
Starks, 1910

5. Parasites, diseases, and anomalies

Bravo Hollis, 1953
Bravo Hollis, and
Deloya, 1973
Siddiqi and Cable, 1960

6. Predators

Klawe, 1961

12. Eggs and larvae

Compton, 1964

13. Juveniles

Klawe, 1961

17. Commercial fishing

Paiva and Mota, 1961
Wolf and Rathjen,
1974 (Explor)

17a. Products

Caland, Viera, and Monteiro,
1968
Viera and Caland, 1968

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394. Marine Flora and Fauna of the Northeastern United States. Tardigrada. By Leland W. Pollock. May 1976, iii + 25 p., figs. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

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