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An Annotated Bibliography of the Cunner, *Tautogolabrus adspersus* (Walbaum)

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An annotated bibliography of the cunner *Tautogolabrus adspersus* (Walbaum)

By

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ABSTRACT

This annotated, indexed bibliography of the cunner contains 347 entries including references on taxonomy, distribution, life history, physiology, behavior, commercial and sport fisheries, and related fields. It may be considered current through June 1972.

INTRODUCTION

The cunner, *Tautogolabrus adspersus* (Walbaum), also known as the chogset or bergall, is commonly found around wharves and docks and on rocky bottoms along the northeastern coast of North America. It is distributed from Newfoundland southward to the mouth of the Chesapeake Bay, with a major center of abundance in the Massachusetts Bay area. In these northern waters, cunners are most numerous in shallow inshore areas, although they are frequently taken near wrecks and shoals up to 30 miles at sea. There is little evidence in support of seasonal migration patterns and individuals remain near their natal areas during their formative years.

At one time, the cunner was a favorite fish of New England anglers. During the 1880's between 200,000 and 300,000 pounds of cunner were taken in the New England commercial harvest. However, since the turn of the century, commercial catches have been negligible because of poor demand.

Though not regarded as a sport fish, the cunner supplies a fishery to thousands of youngsters and tourists who frequent the Northeast coast. Until the 1960's (Clark, 1960; Deuel and Clark, 1965), no record of the number of cunners caught by anglers had been kept. Its importance to anglers, however, was recognized by Bigelow and Schroeder (1953)

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who observed that the total cunner caught "is so considerable that this must be classified as a useful little fish from the recreational standpoint."

This bibliography has attempted to include all known literature on cunner through June 1972. Many of the references have been obtained from standard indexes and abstracts including the Zoological Record, Biological Abstracts, Aquatic Biology Abstracts, Sport Fishery Abstracts, the Current Bibliography for Aquatic Sciences and Fisheries, A Preliminary Bibliography with KWIC Index on the Ecology of Estuaries and Coastal Areas of the Eastern United States (U. S. Fish Wildl. Serv., Spec. Sci. Rep. - Fish. No. 507) by R. L. Livingstone, and Fish of the Gulf of St. Lawrence, An Unabridged Bibliography (Tech. Rep. No. 261 Fish Res. Bd. Canada) by V. M. Srivastava. Except for a very few entries, each citation annotated was personally examined. Portions of the original remarks have been included when possible ambiguities could result from interpretation, when the entire (rare) article is quoted, or when the findings appeared to have particular significance.

We are particularly indebted to Miss Virginia Brandenberg and her staff at the Marine Biological Laboratory Library, Woods Hole, Massachusetts for unfailing assistance throughout this project. Mrs. Ann Hall, Librarian at the National Marine Fisheries Service Laboratory, Beaufort, North Carolina, kindly provided editorial advice. Many state and federal agencies supplied information upon request and we gratefully acknowledge their cooperation.

A subject index has been included to assist in a search of the literature on the cunner. All the references within this bibliography have been included in the index, although the index may not necessarily be complete on all the subjects within any one article. In addition, an addendum has been prepared for the inclusion of references overlooked in preparation of the main body of this communication.

The authors would be most appreciative if articles on the cunner which are not included in this bibliography could be brought to their attention.

Abbott, C. C.
1868. Catalogue of vertebrate animals of New Jersey. Append. E, Fishes, p. 806-830. *In* C. C. Abbott [ed.] Geology of New Jersey.
"This is a numerous species, found about the coast generally, and not prized as an article of food. It has many common names, as nibbler, connor, etc." p. 809.

Agassiz, A.
1878. On the young stages of some osseous fishes. Part I. Development of the tail. Proc. Amer. Acad. Arts Sci., 13: 117-127.
Traces the development of the tail, with special attention to the presence of the embryonic caudal lobe.

Agassiz, A.
1882. On the young stages of some osseous fishes. Part III. Proc. Amer. Acad. Arts Sci., 17: 271-303.
The embryology and larval development is described.

Agassiz, A.
1892. Studies from the Newport Marine Laboratory. XXIX. Preliminary note on some modifications of the chromatophores of fishes and crustaceans. Bull. Mus. Comp. Zool., Harvard Univ., 23 (1892-93): 189-192.
A discussion of coloration and chromatophore presence is presented. Experimental evidence suggests that "to retain a condition of coloring brought about or modified by surrounding influences, the young fish must remain exposed to them for a considerable time, and the modification will be more or less permanent, or of a greater or less degree, according to the age of the fish." p. 191.

Agassiz, A. and C. O. Whitman.
1885a. Communications from the Newport Marine Laboratory. XIV. On the development of some pelagic fish eggs. Preliminary Notice. Proc. Amer. Acad. Arts Sci., 20(4): 23-75.
A detailed description of the embryonic development of the cunner "from the moment of fecundation onward."

Agassiz, A. and C. O. Whitman.
1885b. Studies from the Newport Marine Laboratory. XVI. The development of osseous fishes. I. The pelagic stages of young fishes. Mem. Mus. Comp. Zool., Harvard Univ., 14(1): 1-56. 19 plates.
A general account of embryonic development of the cunner is presented.

Agassiz, A. and C. O. Whitman.
1889. Studies from the Newport Marine Laboratory. XVI. The development of osseous fishes. II. The pre-embryonic stages of development. Pt. 1. The history of the egg from fertilization to cleavage. Mem. Mus. Comp. Zool., Harvard Univ., 14(1): 1-40. 12 plates.
Detailed observations on the "early history of the periblast" are given and eggs are referred to as undergoing typical teleost embryonic development.

Agassiz, A. and C. O. Whitman.
1915. Studies from the Newport Marine Laboratory. XVI. The development of osseous fishes. II. The pre-embryonic stages of development. Pt. 2. The history of the egg: cleavage, formation of the periblast, and development of the germ ring. Mem. Mus. Comp. Zool. Harvard Univ., 40(9): 429-434. 11 plates.
Embryology of the cunner is described and figured.

Alexander, A. B.
1905. Statistics of the fisheries of the New England States, 1902. Rep. U. S. Bur. Fish. for 1904: 245-326.

Catch and market statistics are scattered throughout the text. "The cunner fishery from Boston in 1902 was carried on near islands in Boston Harbor by 9 fishermen with 3 boats. The catch was taken with hoop nets, or fyke nets, and amounted to 38,400 dozen, or 57,600 pounds of cunners, valued at $3,840. The boats made two trips a week during eight months of the year, and averaged 200 dozen cunners to a trip. The fish were of small size,

weighing about 2 ounces each, and sold for an average of 10 cents a dozen. These boats are the last of the 'Irish market boats,' being about 4 tons each and similar to those used in Ireland..." p. 290.

Alperin, I. W. and R. H. Schaefer.
1964. Juvenile bonefish *(Albula vulpes)* in Great South Bay, New York. New York Fish and Game Jur. 11(1): 1-12.
Nineteen juvenile cunners were collected by beach seine from Hercers Island in Great South Bay. July 24 - October 16, 1962.

Ambrose, J.
1870. On fishes of St. Margaret's Bay. Proc. Trans. Nova Scotia Inst. Natur. Sci., 2(2): 87-94.
A short account of the natural history of the cunner in St. Margaret's Bay is given.

American Fisheries Society.
1970. A list of the common and scientific names of fishes from the United States and Canada. 3rd. ed. Spec. Pub. No. 6, Amer. Fish. Soc. 150 pp.
Cunner is listed as the common name of *Tautogolabrus adspersus* (Walbaum).

Anctil, M.
1969. Structure de la rétine chez quelques téléostéens marins du plateau continental. J. Fish. Res. Bd. Canada, 26(3): 597-628.
The retinal structure of the eye is documented. Results indicate that the normal pattern of topographical specialization of cones is absent. This lack of a distinct retinal area is compensated by specific ocular behavior.

Appellöf, A.
1894. Ueber einige Resultate der Kreuzungsbefruchtung bei Knochenfishen. Bergens Museum Aarbog, 1: 1-9.
Cited in Newman (1914) as attempting to hybridize cunner with cod.

Atkins, C. G.
1878. Artificial hatching of the cunner. Forest and Stream, Rod and Gun, 10(26): 502.
"While at Georgetown, I came upon a pair of spawning cunners *(Tautogolabrus)*, and hatched out a few dozen of their eggs. I find that the eggs are about one-half millimeter in diameter, having increased very slightly, if any, after coming from the fish; are exceedingly transparent, perfectly free, adhering neither to each other nor to any other object at any time; they are slightly buoyant in sea water, and slowly rise to the surface, where, if in still water, they remain suspended until hatched. Both impregnated and unimpregnated eggs rise at first, but after the lapse of a few hours, the unimpregnated lose their buoyancy and sink to the bottom. The yolk is more buoyant than the outer shell and rises to the upper side of the latter, which it very readily fills. The embryonic disk forms on the lower side of the yolk. I kept my eggs in vials in my tent, renewing the water from time to time, and think the average temperature maintained was 60° Farenheit; possibly a little higher. Under these circumstances the eggs hatched in three days. In the natural place of deposit the water is undoubtedly considerably colder, possibly 10° and the eggs would then be four or five days in hatching."

Atkins, C. G.
1904. The salmon fishery of Penobscot River and Bay. Rep. U. S. Comm. Fish Fish. for 1903: 110-114.
Cunner was one of 23 species of fish, other than salmon, which were taken in the trap nets and weirs.

Atwood, N. E.
1895. On the habits of some salt-water fishes. Proc. Boston Soc. Natur. Hist., 10: 65-68.
A cunner possessing a malformed snout is cited.

Ayers, W. O.
1843. Enumeration of the fishes of Brookhaven, Long Island, with remarks upon the species observed. Boston J. Natur. Hist., 4(2-3) 26: 255-302.
"Here, as on the other parts of the coast, the Burgall is extremely abundant. They are seen as early as the middle of May, and remain till the last of October, and in

storms are washed up on the beach of the Sound, through the whole winter. Among their numerous varieties of color, I, the last season, saw several specimens which had their entire surface banded with alternate vertical lines of black and light brown, presenting the appearance so singular, that at first I supposed them to be of a distinct species. I have found the dorsal fin rays sometimes 18-10, at others 18-11 and at still others 17-11." p. 263.

Baird, F. T., Jr., and R. L. Dow.
1966. The marine sport fishery and resource in Maine. Dept. of Sea and Shore Fisheries, Augusta, Maine.
The current recreational use of the cunner in Maine is deemed "extensive."

Baird, S. F.
1873a. Report on the condition of the sea fisheries of the south coast of New England in 1871 and 1872. Rep. U. S. Comm. Fish Fish. for 1871-1872: i-xli.
Reference is made to the cunner as a predator of fish eggs and young fry. p. xxix.

Baird, S. F.
1873b. List of fishes collected at Woods Hole. Rep. U. S. Comm. Fish Fish. for 1871-1872: 823-827.
The cunner is listed.

Baird, S. F.
1889. The sea fisheries of eastern North America. Rep. U. S. Comm. Fish Fish. for 1886, Append. A: 3-224.
The distribution is given as Newfoundland to Cape Hatteras. Citations are scattered throughout the text.

Bauchot, M. L.
1963. Catalogue critique des types de poissons du Muséum National d'Histoire Naturelle. Part I - Famille des Labridae. Publications du Muséum National d'Histoire Naturelle, Paris, No. 20. 195 pp.
This gives brief descriptions of specimens in the museum collection.

Bean, T. H.
1881. Check-list of duplicates of North American fishes, distributed by the Smithsonian Institution in behalf of the United States National Museum, 1877-1880. Proc. U. S. Nat. Mus. for 1880, 3: 75-116.
Cunner specimens are listed.

Bean, T. H.
1884. List of the fishes collected by the U. S. Fish Commission at Wood's Holl (sic), Massachusetts, during the summer of 1881. Rep. U. S. Comm. Fish Fish. for 1882, 10: 339-344.
Cunner is listed.

Bean, T. H.
1885. Notes upon an exploration on Long Island Sound. Bull. U. S. Fish. Comm. for 1885, 5:33.
Tautog and cunner are more abundant in inlets.

Bean, T. H.
1888. Report on the fishes observed in Great Egg Harbor Bay, New Jersey, during the summer of 1887. Bull. U. S. Fish. Comm. for 1887, 7: 129-154.
"A single example, 4 1/4 inches long, was seined at the Beesley's Point, August 11, in the grass near the river mouth. The species is called 'bengal' at Somers Point, probably a corruption of bergall." p. 137.

Bean, T. H.
1897. Notes upon New York fishes received at the New York Aquarium, 1895-1897. Bull. Amer. Mus. Nat. Hist., 9: 327-375.
"Cunner.-Found throughout the year. Hardy in the aquarium. Individuals have been kept three years or longer. The food is chiefly hard clams." p. 368.

Bean, T. H.
1901. Catalogue of the fishes of Long Island, with notes upon their distribution, common names, habits, and rate of growth. N. Y. Forest Fish Game Comm., 6th Annu. Rep.: 373-478.
The natural history is briefly described. The range is given as Labrador to New Jersey. "At Woods Hole, Mass., where the fish remain in eel grass in winter,

thousands perish from cold every year." p. 449.

Bean, T. H.
1903a. The food and game fishes of New York: Notes on common names, distribution, habits and capture of New York fishes. N. Y. Forest Fish Game Comm., 7th Annu. Rep.: 251—460.
The habits and occurrences are described. This account is an amplification of Bean (1901).

Bean, T. H.
1903b. Catalogue of the fishes of New York. N. Y. State Mus., Bull. 60, 9: 1-784.
This report contains a taxonomic description, synonymy, and general account of the habits of the cunner and is the same as that given in Bean (1903a).

Bevelander, G.
1935. A comparative study of the branchial epithelium in fishes, with special reference to extraneural excretion. J. Morphol., 57(2): 335-347.
The character of the cunner respiratory epithelium was found to be that of the prevalent flat squamous type. The mucous cells examined were noted to be large and numerous in the interlamellar areas and very numerous on the free surface of lamellae.

Bevelander, G.
1936. Branchial glands in fishes. J. Morphol., 59(2): 215-224.
The branchial glands in the cunner were found to consist of loosely packed, flask-shaped patches of cells. These cells "present a wide variety of shapes, but are for the most part modified columnar cells, which are elongated but extremely irregular." p. 218.

Bigelow, H. B.
1914. Explorations in the Gulf of Maine, July and August, 1912 by the United States Fisheries Schooner GRAMPUS. Oceanography and notes on plankton. Bull. Mus. Comp. Zool., Harvard Univ., 58(2): 29-147.
Data on the larval and postlarval stages taken in the plankton hauls are listed.

Bigelow, H. B.
1917. Explorations of the coast water between Cape Cod and Halifax in 1914 and 1915 by the United States Fisheries Schooner GRAMPUS. Oceanography and plankton. Bull. Mus. Comp. Zool., Harvard Univ., 61(8): 161-357.
The newly spawned eggs of the yellowtail flounder and cunner are likely to be confused but "the two can usually be distinguished by size, the former averaging .9 mm, the latter .75-.85 mm in diameter." p. 226. "Eggs of the cunner *(Tautogolabrus adspersus)* were taken at seven localities always close to land. . . The absence of its eggs at the off-shore stations was to be expected, from its general distribution." p. 267.

Bigelow, H. B.
1928. Plankton of the offshore waters of the Gulf of Maine. Bull. U. S. Bur. Fish. for 1924, 40(2): 1-509.
The various reasons for an absence of pelagic larvae are discussed; i.e., larval drift, low larval survival, poor egg viability. "Some of the cunner *(Tautogolabrus)* larvae produced in St. Marys Bay, which Huntsman (1922) has found to be an important site of reproduction for this fish, must likewise find their way into the Bay of Fundy either around Brier Island or through the passages; but so few of them survive the conditions they encounter in the Bay of Fundy, that none have been recorded from all the winter and summer towing which has been done from the St. Andrews station." p. 73.

Bigelow, H. B., and W. C. Schroeder.
1953. Fishes of the Gulf of Maine. U.S. Fish. Wildl. Serv., Fish Bull., 53(74): 1-577.
This is the best general description (p. 473-478) of the life history.

Bigelow, H. B., and W. W. Welsh.
1925. Fishes of the Gulf of Maine. Bull. U. S. Bur. Fish. for 1924, 40: 1-567.
The ecology of this species is documented (p. 280-286).

Bowers, G. M.
1904. Artificial propagation of marine species. Extracted from the revised edition of the Fish Manual. Pages 195-238, plates 54 to 63. Government Printing Office, Washington.
This gives an identical description of cunner eggs as that in Brice (1898).

Bowers, G. M.
1907. Statistics of the fisheries of the New England States for 1905. Rep. U. S. Comm. Fish. for 1906: 1-93.
Catch and market statistics are given throughout the text.

Breder, C. M., Jr.
1922. The fishes of Sandy Hook Bay. Zoologica, 2(15): 329-351.
A few fish, taken by seine, were recorded in 1920 and 1921.

Breder, C. M., Jr.
1925. Fish notes for 1924 from Sandy Hook Bay. Copeia, 138: 1-4.
Fish were taken in Sandy Hook Bay in 1924.

Breder, C. M., Jr.
1927. The locomotion of fishes. Zoologica, 4(5): 159-297.
The cunner was one of eight labrids whose locomotive movements were studied.

Breder, C. M., Jr.
1938. The species of fish in New York Harbor. Bull. N. Y. Zool. Soc., 41(1): 23-29.
This species occurs in New York Harbor.

Breder, C. M., Jr.
1948. Field book of marine fishes of the Atlantic coast, from Labrador to Texas. G. P. Putnam's Sons, New York. 332 pp.
A brief description (p. 204) of the distribution and habits is presented.

Breder, C. M., Jr., and D. E. Rosen.
1966. Modes of reproduction in fishes. Natural History Press, New York. 941 pp.
This report discusses spawning and sexual dichromatism (p. 509).

Brewer, J.
1965. Marine life on the artificial reef off Fire Island, New York. Underwater Natur., 3(3): 11-14.
Fish were abundant on the "Schaefer Reef."

Brice, J. J.
1898. A manual of fish-culture, based on the methods of the United States Commission of Fish and Fisheries. Rep. U. S. Comm. Fish Fish. for 1897, 23: 1-340.
"The eggs of the cunner or chogset *(Ctenolabrus adspersus)* are of the same size and character as those of its near relation, the tautog, and are deposited during the same season. In water having a mean temperature of 56° F. they have been hatched in 5 days, in the tidal cod-jar. On account of the small size, great abundance, and comparatively little commercial value, the propagation of the cunner has not been regularly undertaken." p. 223.

Briggs, P. T., and J. S. O'Connor.
1971. Comparison of shore-zone fishes over naturally vegetated and sand-filled bottoms in Great South Bay. N. Y. Fish Game J., 18(1): 15-39.
Catch statistics of cunners taken over bottom types in Great South Bay are scattered through the text. Cunners prefer natural bottoms rather than sandfilled areas.

Brook, G.
1885a. Preliminary account of the development of the Lesser Weever-Fish *(Trachinus vipera)*. J. Linnean Soc. Zool., 18: 274-291.
The embryology of *Trachinus* is compared with the cunner embryology investigations of Kingsley and Conn (1883).

Brook, G.
1885b. On some points in the development of *Motilla mostela*. J. Linnean Soc. Zool., 18: 298-306.
Reference is made to the cunner embryology work performed by Kingsley and Conn (1883) and Agassiz and Whitman (1885).

Brunel, P., and J. Bergeron.
1960. Clef d'identification des poissons marins du golfe Saint-Laurent. Contrib. Manuscr. Statist. Biol. Mar., Canada, No. 8.34 pp.
The cunner is cited (p. 32).

Bulloch, D.
1965. The development of the wreck, 'Pinta' as a marine habitat. Underwater Natur., 3(1) : 17-19, 31-32.
Cunners were noted as the first fishes to appear around the wreck.

Bumpus, H. C.
1898. The breeding of animals at Woods Hole during the months of June, July, August. Science, 8(20): 850-858.
"The cunner, *Tautogolabrus adspersus*, spawns during June and early July, and the bright colored young are abundantly found throughout the latter part of the summer. . . The auftrieb is not rich in surface vertebrates during the summer. . . In early July, young swellfish, cunners, sticklebacks, tautog, sandeels, silversides, hake and sand dabs (occur)." p. 852.

Bumpus, H. C.
1900. The preparation of a list of fishes known to inhabit the (Narragansett) bay. Ann. Rep. Comm. Inland Fish, Rhode Island, 30: 46-53.
The cunner is listed.

Clark, H. A.
1887. A geographical review of the fisheries industries and fishing communities for the year 1880. Part III. The fisheries of Massachusetts, p. 113-280. *In* G. B. Goode [ed.], The fisheries and fishery industries of the United States, Section 2.
Catch statistics are scattered throughout the text. "Sea perch, or cunners, were taken in much larger quantities a few years ago than at present; 38,000 dozen were sold in Boston during 1879. The market could dispose of many times this amount if they were taken, but for some unexplained cause the supply has largely decreased during the past few years." p. 196-197.

Clark, J. R.
Undated. The 1960 salt-water angling survey. U. S. Fish Wildl. Serv., Circ. 153, 33 pp.
Cunner fishery statistics are included in tables throughout text.

Clark, J. R.
1962. Report of the first littoral survey: results of the Labor Day fish count, September 1961. Amer. Littoral Soc., Littoral Surv. Rep., 1(1): 1-23.
Teams of divers observed cunners occurring in the waters of long Island, N. Y. (Huntington, Jones Beach, Island Park, Rockaway) and coastal N. J. (Raritan Bay, Long Branch, Elberon, Deal, Allenhurst, Barnegat Light Township).

Cockerell, T. D.
1913. Observations on fish scales. Bull. U. S. Bur. Fish. for 1912, 32: 117-174.
A description of labrid scales, with a key for identification, is provided. Cunner scales are described as smaller than 7 mm, possessing very poorly developed apical radii, and possessing very thick apical skin.

Cole, C. F.
1967. The ecology of the young fishes of the Weweantic River Estuary (WR-2). Proc. Water Res. Symp. Univ. Mass. No. 2: 22-26.
Reference is made to Lebida (1969) on the eggs and larvae in the Weweantic River Estuary. Cunner eggs were among the most abundant eggs found with "the great bulk of tautog and cunner spawning apparently. . . at the mouth of the estuary."

Collins, H. H., Jr.
1959. Complete field guide to American wildlife. East, Central, and North. Harper and Row, New York. 683 pp.
A brief description (p. 495) of the habitat, food, range, and spawning period of the cunner is provided.

Collins, J. W.
1892. Statistical review of the coast fisheries of the United States. Pt. 3. Fisheries of the New England States (1887-1888). Rep. U. S. Comm. Fish Fish. for 1888: 286-332.

The cunner is listed throughout text in tables of catch statistics.

Collins, J. W. and H. M. Smith.
1892. Report on the fisheries of the New England states. Bull. U. S. Fish Comm. for 1890: 73-176.
Catch statistics of the cunner are listed.

Colton, J. B., Jr., and R. R. Marak.
1969. Guide for identifying the common planktonic fish eggs and larvae of continental shelf waters, Cape Sable to Block Island. Bur. Comm. Fish. Woods Hole, Mass., Biol. Lab., Ref. 69-9, 43 pp.
Identifying characteristics of the cunner eggs, prolarvae, and postlarvae are discussed. (p. 23).

Cooper, A. R.
1915. Trematodes from marine and fresh water fishes including one species of ectoparasitic turbellarian. Trans. Roy. Soc. Canada, Sect. 4, Ser. 3, 9: 181-205.
"I have also noticed that the skin of a number of fishes taken in Passamaquoddy Bay, notably *Tautogolabrus adspersus* (Walb.), Cunner, is greatly infected with small pigmented cysts, similar to those described *(Tocotrema lingua)* which in all probability would be found to contain larvae of this species: Linton describes the species from the cunner." p. 190.

Cooper, A. R.
1921. Trematodes and cestodes of the Canadian Arctic expedition, 1913-1918. p. 1-27. *In* A. R. Cooper [ed.], Report of the Canadian Arctic Expedition, 1913-1918, Vol. 9, Part G-H., Ottawa, Canada.
Cunner is noted as a host for cestode *Abothrium rugosum*.

Cornish, G. A.
1907. Notes on the fishes of Canso. Contrib. Canadian Biol. for 1902-1905: 81-90.
Cunners were noted to be abundant about the wharfs during the summers of 1901 and 1902. One specimen was found in the stomach of *Raja ocellata*.

Cornish, G. A.
1912. Notes of fishes of Tignish, Prince Edward Island. Contrib. Canadian Biol. for 1906-10: 79-81.
Summer observations were made on the ichthyofauna (including cunner).

Costello, D. P., M. E. Davidson, A. Eggars, M. H. Fox, and C. Henley.
1957. Methods for obtaining and handling marine eggs and embryos. Marine Biological Laboratory, Woods Hole, Mass. Lancaster Press, Lancaster, Penn. 247 pp.
The procedures for procuring, handling, and observing cunner eggs for laboratory use are described.

Cox, P.
1895. Catalogue of the marine and fresh-water fishes of New Brunswick, Bull. Natur. Hist. Soc. New Brunswick, 13: 62-75.
Cunners were observed along the coast of the Gulf of St. Lawrence.

Cox, P.
1921. List of fishes collected in 1917 off Cape Breton coast and the Magdalen Islands. Contrib. Canadian Biol. for 1918-20: 109-114.
"Cunner. Blue Perch. Everywhere in abundance. Swarming in shore waters and taken in traps to a depth of 10-20 m." p. 111.

Craigie, E. H.
1927. Sex-ratio in Canadian marine fishes. Contrib. Canadian Biol., 3(22): 491-499.
Sex-ratio data was obtained from the file records of the Atlantic Biological Station. Only 356 males were recorded from 811 cunner observed (44%).

Cuvier, M. Le B., and M. A. Valenciennes.
1839. Histoire naturelle des poissons, Vol. 13. Pitois-Levrault, Paris. 505 pp. Reprinted 1969, A. Asher & Co., Amsterdam.
General and taxonomic descriptions are given (p. 237-240).

Dannevig, A.
1919. Biology of Atlantic waters of Canada. Canadian fish-eggs and larvae. Canadian Fish.

Exped. for 1914-15: 1-74.
The occurrence, distribution, and abundance of cunner eggs obtained in 1914-15 is documented.

Davis, R. E., and J. E. Bardach.
1965. Time coordinated prefeeding activity in fish. Anim. Behavior, 13(1): 154-162.
Laboratory experiments were conducted on cunner, tomcod, killifish, scup, and flounder. Results indicated that no pre-light or pre-feeding activity occurs in cunners. Individuals seldom fed and would not tolerate companions in the aquarium.

Dawson, A. B.
1932. The reaction of the erythrocytes of vertebrates, especially fishes to vital dyes. Biol. Bull. (Woods Hole), 63(1): 48-73.
"Cunner. The erythrocytes of this fish very closely resemble in their staining reactions those of the two preceding forms (Toadfish and Tautog). Fewer immature cells were noted than in the tautog, and in general the reticulation patterns are very meager. The primary granules also appear as basophilic bodies with Wright's stain." p. 55.

Dawson, A. B.
1933. The relative numbers of immature erythrocytes in the circulating blood of several species of marine fishes. Biol. Bull. (Woods Hole), 64(1): 33-43.
Cunners were found to possess almost all (99+%) mature erythrocytes in their circulatory systems. These results were almost identical to those obtained for the toadfish, tautog, sea bass, pipefish, sand dab, weakfish, and sharksucker.

Dean, B.
1895. Fishes, living and fossil. An outline of their forms and probable relationships. MacMillan and Co., New York. 300 pp.
The larval development of the cunner is described and figured (p. 224-226).

De Camp, M.
1963. Exploring a northern reef. Underwater Natur., 1(2): 16.
Concentrations of cunners were noted to surround the wreck 'Mohawk' located off Manasquan Inlet, N. J. on September 16, 1962.

De Kay, J. E.
1842. Zoology of New York. Part IV. Fishes. W. and A. White and J. Visscher, Albany. 415 pp.
A description of the taxonomic features, color, habitat and range of the cunner *(Ctenolabrus ceruleus* and *Ctenolabrus uniotatus)* is given. "The Bergall has various popular names: 'Nibbler', from its vexatious nibbling at the bait thrown out for other fishes; 'Chogset', a name derived from the Mohegan dialect, but its purport unknown; 'Burgall', I suppose to be of Dutch origin, as its use seems to be confined to the neighborhood of New York. It is also called 'Blue-Fish', on account of its prevailing color. At Boston, it is often called 'Blue Perch' and generally among the eastern fisherman, 'Cunner', or 'Connor'. This last name is applied to a *Crenilabrus* on the coast of Sussex and Hampshire in England, from whence I presume it was derived." p. 173.

Denton, S. F.
1901. Figures of fishes in colors. N. Y. Forest Fish Game Comm., 6th Annu. Rep.: 367-372.
The natural history is described.

De Sylva, D. P., F. A. Kalber, Jr., and C. N. Shuster, Jr.
1962. Fishes and ecological conditions in the shore zone of the Delaware River Estuary, with notes on other species collected in deeper waters. Univ. Delaware Mar. Lab., Infor. Ser., Pub. No. 5: 1-164.
Two cunners were caught by hook and line off Cape Henlopen on July 8, 1958 (p. 37).

Deuel, D. G., and J. R. Clark.
1968. The 1965 salt-water angling survey. U. S. Fish Wildl. Serv., Resource Pub. 67, 51 pp.
Angling statistics are listed.

Dew, C. B.
1970. A contribution to the life history of the cunner, *Tautogolabrus adspersus*

Walbaum, in Fishers Island Sound. M. S. thesis, Univ. Conn., 35 pp.
An investigation of the "age and growth, length and weight relationships, spawning period, age at maturity, sex ratio, and nocturnal and winter habits of the cunner in Fishers Island Sound."

Dexter, R. W.
1944. The bottom communities of Ispwich Bay, Massachusetts. Ecology, 25(3): 352-359.
The cunner is listed (p. 356) as belonging to the "permanent influents" of the Ipswich Bay bottom community.

Dexter, R. W.
1947. The marine communities of a tidal inlet at Cape Ann, Massachusetts: A study in bio-ecology. Ecol. Monogr., 17(3): 261-294.
Cunners are noted to be a "permanent influent" in five different marine biological communities. The food webs of each of these systems (depicting the interaction of the cunner) are illustrated.

Edwards, R. L.
1958. Species composition of industrial trawl landings in New England, 1957. U. S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. No. 266, 23 pp.
Catch statistics are given.

Edwards. R. L., and L. Lawday.
1960. Composition of industrial trawl-fish landings in New England, 1958. U. S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. No. 346, 20 pp.
Cunner is listed in catch statistics.

Ehrenbaum, E.
1905-1909. Eier und Larven von Fischen des Nordischen Planktons. Nord. Plankt. 2 Parts (1-216), (217-413). (Reprinted 1964 by A. Ascher & Co., Amsterdam. 413 pp.)
Reference is made to the fact that the egg and larval development of the cunner is similar to that of the European labrid, *Labrus rupestris.*

Eisler, R.
1965. Erythrocyte counts and hemoglobin content in nine species of marine teleosts. Chesapeake Sci., 6(2): 119-120.
An intermediate hemoglobin value of 8.31 gm. per 100 ml is listed.

Fairbanks, R. B., W. S. Collings, and W. T. Sides.
1971. An assessment of the effects of electrical power generation on marine resources in the Cape Cod Canal. Mass. Dep. Natur. Resour., Div. Mar. Fish., 48 pp.
The distribution and abundance of adults as well as eggs and larvae was studied. No significant differences were noted in abundance for any cunner stage due to the operation of the electrical power facility.

Field, I. A.
1907. Unutilized fishes and their relation to the fishing industries. Rep. U' S' Comm. Fish. for 1906: 1-50.
An account of the uses, foods, characters and distribution, and possible destructiveness of the cunner.

Fish, C. J.
1925. Seasonal distribution of the plankton of the Woods Hole region. Bull. U. S. Bur. Fish. for 1925, 41: 91-179.
The occurrence of larvae in the Woods Hole region is documented and graphically represented. "In the summer the most abundant fish larvae, were *Tautogolabrus adspersus* and *Tautoga onitis*. Both have pelagic eggs which appear in June and remain until August."

Fish, C. J., and M. W. Johnson.
1937. The biology of the zooplankton population in the Bay of Fundy and Gulf of Maine with special reference to production and distribution. J. Biol. Bd. Canada, 3(3): 189-322.
The distribution of cunner eggs and larvae obtained from tow net collections is briefly cited.

Fish, M. P.
1954. The character and significance of sound production among fishes of the western North Atlantic. Bull. Bingham Oceanogr. Coll., 14(3): 1-109.
An account containing sections on the recorded sounds, mechanisms involved, and significance of the cunner as a soundmaker (p. 53-55).

Fish, M. P., A. S. Kelsey, Jr., and W. H. Mowbray.
1952. Studies on the production of underwater sound by North Atlantic coastal fishes. J. Mar. Res., 11(2): 180-193.
The biological origin of sound produced by fishes is discussed. The sound produced by the cunner consists of a low thump caused by the air bladder.

Fish, M. P., and W. H. Mowbray.
1970. Sounds of western North Atlantic fishes. A reference file for biological underwater sounds. Johns Hopkins Press, Baltimore. 207 pp.
The distribution, habits, size, sound production and sonic mechanism of the cunner is discussed (p. 136).

Fiske, J. D., J. R. Curley, and R. P. Lawton.
1968. A study of the marine resources of the Westport River. Mass. Div. Mar. Fish., Monogr. Ser. No. 7. 52 pp.
Cunner is listed and discussed as one of the species obtained from the Westport River.

Fiske, J. D., C. E. Watson, and P. G. Coates.
1966. A study of the marine resources of the North River. Mass. Div. Mar. Fish., Monogr. Ser. No. 3. 53 pp.
Cunner is listed as a species taken in the North River area.

Fiske, J. D., C. E. Watson, and P. G. Coates.
1967. A study of the marine resources of Pleasant Bay. Mass. Div. Mar. Fish., Monogr. Ser. No. 5. 56 pp.
Cunner is listed and discussed as one of the species of finfish obtained from Pleasant Bay.

Fletcher, G. L., R. J. Hoyle, and D. A. Horne.
1971. The relative toxicities of yellow phosphorus production wastes to seawater-maintained fish. Tech. Rep. Fish. Res. Bd. Canada, No. 255. 14 pp.
Experiments indicate that yellow phosphorus is lethal at very low concentrations.

Forbes, J. C.
1927. The effects of various treatments on the tensile strength of fish muscle. Contrib. Canadian Biol., 3(21): 467-487.
The average tensile strength was 38 ounces. This was higher than any of the six fish species tested, except for the muttonfish.

Fortin, P.
1864. Continuation of the list of fish of the Gulf and River St. Lawrence. Ann. Rep. of Pierre Fortin for 1863, App. No. 40, Rep. Comm. Crown Lands of Canada (1863), Sessional Paper No. 5. 12 pp.
The distribution and habits of the cunner are discussed.

Fowler, H. W.
1906. The fishes of New Jersey. Ann. Rep. N. J. State Mus. for 1905, Pt. 2: 35-477. 103 plates.
A taxonomic description and brief account (p. 343-344) of the habits of the cunner is provided.

Fowler, H. W.
1908. Further notes on New Jersey fishes. Ann. Rep. N. J. State Mus. for 1907: 120-189.
A detailed description (p. 180-181) of the cunner is provided.

Fowler, H. W.
1909. Notes on New Jersey fishes. Ann. Rep. N. J. State Mus. for 1908: 351-392.
"At Corson's Inlet and Barnegat Pier Dr. Phillips has taken this fish. He says they are plentiful early in the season till late, and are never much over six, and mostly three or four inches in length. It is occasionally eaten, though the flesh is not as firm eating as that of the tautog. It is a great bait-stealer." p. 386.

Fowler, H. W.
1912. Records of fishes from the middle Atlantic states and Virginia. Proc. Acad. Natur. Sci. Phila., 64: 34-59.
The fish occurs at Hunter's Island, New York and Corson' Inlet, New Jersey.

Fowler, H. W.
1916. Records of northern New Jersey fishes. Copeia, No. 31: 41-42.
The cunner is listed as an addition to the New York Aquarium's collection of fishes attained from New Jersey waters.

Fowler, H. W.
1917. Notes on some New England Fishes. Proc. Boston Soc. Natur. Hist., 35: 109-138.
The cunner is listed as occurring at Boston Harbor, Nantucket, and Woods Hole.

Fowler, H. W.
1920a. A list of the fishes of New Jersey. Proc. Biol. Soc., Wash., 33: 139-170.
The cunner is listed.

Fowler, H. W.
1920b. Notes on New Jersey, Pennsylvania, and Virginia fishes. Proc. Acad. Natur. Sci. Phila., 1919 (1920): 292-300.
The cunner is listed as occurring at Atlantic City and Corson's Inlet.

Fowler, H. W.
1926. Records of fishes in New Jersey. Copeia, No. 156: 146-150.
The fish occurs at the Longport stone jetty, Atlantic City.

Fowler, H. W.
1928. Notes on New Jersey fishes. Proc. Acad. Natur. Sci., Phila., 80:607-614.
The cunner is listed.

Fowler, H. W.
1937. Notes on fishes from the Gulf Stream and the New Jersey coast. Proc. Acad. Natur. Sci., Phila., 89: 297-308.
The cunner is listed as one of the species occurring along the New Jersey coast.

Fowler, H. W.
1952. A list of fishes of New Jersey, with off-shore species. Proc. Acad. Natur. Sci., Phila., 104: 89-152.
The cunner is listed.

Freeman, B. L.
1970. The recreational marine fishery of northern Buzzards Bay, Massachusetts and a statistical method to sample its anglers. M. S. thesis, Univ. Mass., 108 pp.
The occurrence of the cunner in Buzzards Bay and statistics of the fishery are cited.

Gibbons, E.
1964. Stalking the blue-eyed scallop. David McKay Co., New York. 332 pp.
Techniques for fishing for cunner and preparing them as food are discussed.

Gibbons, N. E.
1934a. Lactose-fermenting bacteria from the intestinal contents of marine fish. Contrib. Canadian Biol., 8(23): 291-300.
Bacterium found within cunner included *E. coli*, *E. grunthali*, and *B. immobolis*. "These fish live largely on refuse, and there is ample opportunity for contamination from human sources." p. 295.

Gibbons, N. E.
1934b. The slime and intestinal flora of some marine fishes. Contrib. Canadian Biol., 8(22): 275-290.
Cunner slime possessed bacteria of the genera *Micrococcus*, *Achromobacter*, and *Flavobacterium*. Cunner faeces contained bacteria of the following genera: *Micrococcus*, *Achromobacter*, *Flavobacterium*, and *Proteus*.

Gill, T.
1862. Catalogue of the fishes of the eastern coast of North America from Greenland to Georgia. Proc. Acad. Natur. Sci. Phila., for 1861, 13: 1-63.
The cunner is listed.

Gill, T.
1865. Synopsis of the fishes of the Gulf of St. Lawrence and Bay of Fundy. Canadian Nat. Geol., New Series 2: 244-266.
The cunner is listed.

Gill, T.
1873. Catalogue of the fishes of the east coast of North America. Rep. U. S. Comm. Fish Fish. for 1871-1872: 779-882.
The cunner is listed.

Gill, T.
1904. The state ichthyology of Massachusetts. Science, 20(506): 321-338.
This provides the same account as in Gill (1905).

Gill, T.
1905. State ichthyology of Massachusetts. Rep. U. S. Bur. Fish. for 1904: 163-188.
Describes the confusion of the common name "perch". "In England the name is specifically applied to a well known fresh-water fish *(Perca fluviatilis)*. The immigrants to New England found a fish almost undistinguishable from it, and properly gave it the same name. . ." p. 167.

Golvan, Y. J.
1965. Catalogue systématique des noms de genres de poissons actuels. Mason, et Cie., Paris. 237 pp.
Tautogolabrus is listed as one of the many genera in the family Labridae (p. 122).

Goode, G. B.
1879. Catalog of the collections to illustrate the animal resources and the fisheries of the United States. Bull. U. S. Nat. Mus., 14: 1-354.
Cunner specimens are listed. Distribution of the cunner is given (p. 36) as "Newfoundland to Cape Hatteras."

Goode, G. B.
1884. The chogset or cunner — *Ctenolabrus adspersus*, p. 273-274. *In* G. B. Goode [ed.], The fisheries and fishery industries of the United States, Sec. 1, Pt. 3, No. 87.
A popular account of the habits and life history of the cunner.

Goode, G. B.
1888. American fishes. A popular treatise upon the game and food fishes of North America with especial reference to habits and methods of capture. W. A. Houghton, New York. 496 pp.
The account of the cunner given in Goode (1884) is repeated here.

Goode, G. B.
1890. The color of fishes. Science, 15(374): 211-213.
"On certain ledges along the New England coast the rocks are covered with dense growths of scarlet and crimson seaweeds. The cod-fish, the cunner, the sea-raven, the rock-eel and the wry-mouth, which inhabit these brilliant groves, are all colored to match their surroundings; the cod, which is naturally lightest in color, being most brilliant in its scarlet hues, while the others, whose skins have a larger original supply of black, have deeper tints of dark red and ruddy brown. These changes must be due to the secretion of a special supply of red chromatophores. It has occurred to me that the material for the pigmentary secretion is probably derived indirectly from the algae, for, though the species referred to do not feed upon these plants, they devour in immense quantities the invertebrate animals inhabiting the same region, many of which are likewise deeply tinged with red." p. 212.

Goode, G. B., and T. H. Bean
1880. A list of the fishes of Essex County, Massachusetts Bay and the contiguous deep waters. Bull. Essex Inst., 11: 1-38.
"Cunner. Common everywhere in shallow water and in harbors. Called 'Nipper' at Salem." p. 14.

Gordon, B. L.
1957. The common cunner. Maine Coast Fisherman, 12(4): 10.
A brief description of the habits of the cunner is given.

Gordon, B. L.
1960. The marine fishes of Rhode Island. The Book and Tackle Shop, Watch Hill, Rhode Island. 136 pp.
The fish is mentioned as "very common around rocks, wharves and jetties" p. 71.

Gorham, F. P.
1899. The gas-bubble disease of fish and its cause. Bull. U. S. Fish. Comm., 19: 33-38.
The cunner is listed as one of the 18

marine fishes that were "affected by the disease during the spring and summer of 1898, and the list includes all the fish, with two exceptions, which were kept in the aquaria of the Fish Commission at Woods Hole, Mass., from March to September." p. 33.

Graham, J. J., and H. C. Boyar.
1965. Ecology of herring larvae in the coastal waters of Maine. Int. Comm. Northwest Atl. Fish., Spec. Pub. 6: 625-634.
Cunner larvae were captured in the Sheepscot - Boothbay - Damariscotta region of Maine during August - October, 1961-62.

Grant, L. J., ed.
1969. Wondrous world of fishes. National Geographic Society, Washington, D. C. 373 pp.
The tautog and cunner are often observed to swim together (p. 206).

Gray, I. E., and F. G. Hall.
1930. Blood sugar and activity in fishes with notes on the action of insulin. Biol. Bull., (Woods Hole), 58(3): 217-223.
The fish possesses an average blood sugar level of 25.2 mg sugar per 100 cc of blood. "The results indicate that the blood sugar level of the cunner is similar to that of relatively inactive and sluggish fishes such as the "sand-dab, *Lophopsetta maculata* and the puffer, *Spheroides maculatus*." p. 220—221.

Greeley, J. R.
1939. A biological survey of the salt waters of Long Island, 1938. Section II. Fishes and habitat conditions of the shore zone based upon July and August (1938) seining investigations. Suppl. 28th Ann. Rep. N. Y. Cons. Dept., Pt. 2: 72-92.
"Cunner. The young of this resident species were found to be moderately common and widely distributed, the 27 collections representing both the north and south shore regions. Early July to late August specimens were represented, the smallest being 15 millimeters. Several juvenile individuals, probably one year old, were taken but adults were not seined as they are in deeper water than could be covered by shore seining." p. 88.

Green, J. M., and M. Farwell.
1971. Winter habits of the cunner, *Tautogolabrus adspersus* (Walbaum 1792), in Newfoundland. Canadian J. Zool., 49(12): 1497-1499.
SCUBA diving observations as well as laboratory experiments demonstrated that cunners remain torpid under rocks in shallow water when winter temperatures fall below 5° C.

Gregory, W. K.
1933. Fish skulls: A study of the evolution of natural mechanisms. Trans. Amer. Phil. Soc., 23(2): 75-481. (Reprinted 1959 by Eric Lundberg, Laurel, Florida. 481 pp.)
The cranial structure is figured. "In *Tautogolabrus* (Fig. 129), as in other labrids, the ascending processes of the premaxilla are longer than the aveolar branch. The latter is attached at its distal end to the lower end of the maxilla, which in turn is fastened to the side of the mandible. Hence, a lowering in the mandible draws the premaxillae downward and forward." p. 256.

Gregory, W. K., and F. La Monte.
1947. The world of fishes. Amer. Mus. Natur. Hist., New York. 96 pp.
"Apparently nature grew reckless when she colored the Wrasses and Parrot Fishes, for these are among the most bizarre sights that bewilder the eye of the visitor to undersea gardens in tropical waters. Only the Cunner and the Tautog, among the northern outliers of the family, have been toned down into sobriety and somberness in the chilly waters of New England. The cunner retains the loose, protruding lips and retreating forehead of its tropical ancestors, but the tautog has acquired a short, stiff mouth, a prominent chin, and a generally determined countenance". p. 57.

Greig, R. A., and R. H. Gnaedinger.
1971. Occurrence of thiaminase in some common aquatic animals of the United States

and Canada. U. S. Dep. Commer., Nat. Mar. Fish. Serv., Spec. Sci. Rep. Fish No. 631. 7 pp.

The cunner was analyzed for the presence of thiaminase. Reference is made to the work of Lee (1948) from which the results on the cunner were taken.

Gross, A. O.
1923. The black-crowned night heron *(Nycticorax nycticorax nacuicus)* of Sandy Hook. Auk, 40: 1-30.

Cunner is cited (p. 19) as a food item of the night heron.

Günther, A.
1861. Catalogue of the fishes in the British Museum, Vol. 4. London. (Reprinted 1964, Strechert-Hafner Service Agency, Inc. New York. 534 pp.)

The taxonomic description with synonomy is given (p. 90-91).

Günther, A.
1880. An introduction to the study of fishes. Adam and Charles Black, Edinburgh. 720 pp.

The author lists (p. 527) the cunner *(Ctenolabrus burgall)* as being common on the North American coast.

Günther, A.
1886. Handbuch of Ichthyologie. Carl Gerold's Sohn, Vienna. 527 pp.

The fish is noted (p. 376) as occurring on the North American coast.

Halkett, A.
1913. Check-list of fishes of the Dominion of Canada and Newfoundland. Ottawa, Canada. 138 pp.

The cunner is cited (p. 89).

Hall, F. G.
1930. The ability of the common mackerel and certain other marine fishes to remove dissolved oxygen from sea water. Amer. J. Physiol., 93: 417- 421.

Investigations concerning the lowest oxygen tension at which marine fishes are capable of removing dissolved oxygen demonstrated that cunners could remove dissolved oxygen at an oxygen tension of 14.8 mm Hg.

Hall, F. G., and I. E. Gray.
1929. The hemoglobin concentration of the blood of marine fishes. J. Biol. Chem., 81(3): 589-594.

The hemoglobin concentration results of four cunners are presented. The results indicate that the cunner was in the intermediate range of hemoglobin concentration of the 15 teleost species tested, - lower than bonito, mackeral and menhaden but higher than goosefish, toadfish and sanddab.

Haugaard, N., and L. Irving.
1943. The influence of temperature upon the oxygen consumption of the cunner in summer and winter. J. Cell. Comp. Physiol., 21(1): 19-26.

Laboratory experiments on cunner acclimated in tanks containing waters of 18-22° C (summer temperature) and 1-3° C (winter temperature) indicated that the rate of oxygen consumption of the "winter fish" was a little higher than that of the "summer fish" at all temperatures below 15° C. "Since the difference is small, the depression of metabolism caused by the low temperatures in winter probably leaves too little physiological activity to enable the cunners to stay in their summer habitat. . . The information about the winter habits of the cunner seems to agree with the experimental observations." p. 25.

Heller, A. F.
1949. Parasites of cod and other marine fish from the Baie de Chaleur region. Canadian J. Res., 27D(5): 243-264.

Two fish were examined for parasites. Specimens of the nematode species, *Contracaecum aduncum*, were found internally.

Herman, S. S.
1958. The planktonic fish eggs and larvae of Narragansett Bay. M. S. thesis, Univ. Rhode Island, 61 pp.

The numbers of eggs and larvae of the cunner collected in plankton hauls in 1957 is documented; "More cunner eggs were collected during the study than any other

species, 12,592 eggs being taken from early May through September." p. 42. Reference is also made to the great difficulty encountered in distinguishing cunner eggs from tautog eggs.

Herman, S. S.
1963. The planktonic fish eggs and larvae of Narragansett Bay. Limnol. Oceanogr., 8(1): 103-109.
This report contains the results of Herman's plankton work cited above. Tables (p. 106-107) list the number, occurrence, abundance, and characteristics of the eggs and larvae obtained in the plankton sampling.

Hildebrand, S. F., and W. C. Schroeder.
1928. Fishes of the Chesapeake Bay. Bull. U. S. Bur. Fish. for 1927, 43 Pt. 1: 1-388.
The authors discuss the general life history of the cunner (p. 320-321). Only one fish had ever been taken in a Chesapeake locality.

Holmes, E.
1862. Report on the fishes of Maine, including some of the elementary principles of ichthyology. Natur. Hist. Geol. Maine, Second Ann. Rep.: 11—117.
Ctenolabrus burgall is listed.

Howe, A. B.
1971. Biological investigation of Atlantic tomcod, *Microgadus tomcod* (Walbaum), in the Weweantic River Estuary, Massachusetts, 1967. M. S. thesis, Univ. Mass., 82 pp.
The cunner is cited as one of six species of fish which was found in the stomachs of tomcod (p. 31, 33).

Hunter, G. W., III, and E. Wasserman.
1941. Observations on the melanophore control of the cunner, *Tautogolabrus adspersus* (Walbaum). Biol. Bull. (Woods Hole), 81(2): 300.
Background responses under a constant source of illumination were studied in the cunner. "The cunner has a melanophore system controlled by adrenergic and cholinergic sets of nerve fibers. . ."

Huntsman, A. G.
1918a. The effects of the tide on the distribution of the fishes of the Canadian Atlantic coast. Trans. Roy. Soc. Canada, Ser. 3, 12(4): 61-67.
The distributions of the cunner in the Gulf of St. Lawrence and in the Bay of Fundy are compared. It is concluded that the "absence of heavy tides makes the Gulf of St. Lawrence, and in particular the Magdalen shallows, an important spawning ground for many species of fishes with pelagic eggs, and the presence of heavy tides prevents the Bay of Fundy serving in a similar capacity. . ." p. 66.

Huntsman, A. G.
1918b. The growth of the scales in fishes. Trans. Roy. Canadian Inst., 12: 61—101.
Analysis of the rleationship of total length to scale length in the cunner is presented. The conclusion is reached that in the cunner "there is to be found a lack of correspondence in the rates of growth of the scales and of the body, as judged by their anterioposterior diameters (for the scale, particularly of the anterior field). The scale begins its growth later, grows relatively more rapidly than the body during the first half of life, and less rapidly than the body during the second half." p. 91.

Huntsman, A. G.
1922. The fishes of the Bay of Fundy. Contrib. Canadian Biol. for 1921(3): 49-72.
"Very common and of all sizes in St. Mary Bay which must be a successful breeding place and centre of dispersal. Known to the fishermen in Annapolis basin, but not common, and taken only on lines, no small specimens seen... The eggs have been taken in Passamaquoddy Bay, but no larvae have been found..." p. 15.

Huntsman, A. G.
1923. Natural lobster breeding. Bull. Biol. Bd. Canada, 5: 1-11.
The disparity between the absence of cunner fry in the Bay of Fundy and the "prodigious quantity" of cunner found in the Magdalen shallows was investigated. It

was concluded that since the Bay of Fundy main mass of water does not rise above 50° F in summer, it is not warm enough for the successful development of the cunner eggs.

Huntsman, A. G., W. B. Bailey, and H. B. Hachey.
1954. The general oceanography of the Strait of Belle Isle. J. Fish. Res. Bd. Canada, 11(3): 198-260.
A discussion on the occurrence of cunner eggs, larvae, and adults is given. Fish were abundant with lobsters in the warm shallow water along the northern part of the east coast of Newfoundland.

Huver, C. W.
1965. Occurrence of a northern pike in Fisher's Island Sound. N. Y. Fish and Game Jour., 12(1): 113.
Cunner is cited as one of the fish species that is taken in the sportsmen's catch in Fisher's Island Sound near shore at Groton Long Point.

Hyman, L. H.
1921. The metabolic gradients of vertebrate embryos. Biol. Bull. (Woods Hole), 40(1): 32-72.
A detailed study of the susceptibility of the developing eggs of the cunner, cod, and killifish to toxic solutions.

Jacobowitz, D. M., and A. M. Laties.
1968. Direct adrenergic innervation of a teleost melanophore. Anat. Rec., 162(4): 501-504.
Sympathetic innervation to melanophores in fish was investigated using a catecholamine histochemical fluorescence method. "catecholamine-containing fibers were observed to be in close anatomic proximity to the conjuctival and dermal melanophores of the cunner (*Tautogolabrus adspersus*)." Catecholamines released from these adrenergic fibers are capable of causing aggregation of pigment with blanching of skin color.

James, J. F.
1887. Catalogue of the mammals, birds, reptiles, batrachians, and fishes in the collection of the Cincinnati Society of Natural History. J. Cincinnati Soc., 10:34-48.
The cunner is listed.

Jerome, W. C., Jr., A. P. Chesmore, and C. O. Anderson, Jr.
1967. A study of the marine resources of Beverly-Salem Harbor. Mass. Div. Mar. Fish., Monogr. Ser. No. 4. 74 pp.
The fish occurs in the Beverly-Salem Harbor area.

Jerome, W. C., Jr., A. P. Chesmore, and C. O. Anderson.
1969. A study of the marine resources of the Annisquam River - Gloucester Harbor coastal system. Mass. Div. Mar. Fish., Monogr. Ser. No. 8. 62 pp.
A brief discussion of cunner taken from the Annisquam River - Gloucester Harbor is given.

Johansen, F.
1925. Natural history of the cunner. Contrib. Canadian Biol., 2(17): 423-468.
The most comprehensive and complete account of the occurrence, habits, development, and life history of the cunner available.

Johansen, F.
1926a. Fishes collected in Newfoundland during the autumn of 1922. Canadian Field-Natur., 40(1): 1-6.
The fish is noted as occurring in Conception Bay.

Johansen, F.
1926b. Fishes collected in the Gaspé Peninsula during August of 1922. Canadian Field-Natur., 40(8): 175-178.
Six specimens of cunner, ranging between 14 1/2 - 27 cm in length, were noted at the pier at Port Daniel on August 8, 1922.

Jones, J. M.
1865. Notes on Nova Scotia fishes. Canadian Natur. Geol., New Series 2: 128-135.
An account of the biology and economic importance is provided.

Jones, J. M.
1879. List of the fishes of Nova Scotia. Proc. Trans. Nova Scotia Inst. Natur. Sci., 5 (append.): 87-97.
The cunner is "very common during the summer months in harbours and bays." p. 91.

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. Rep. U. S. Comm. Fish Fish. for 1885, Pt. 13, Append. E: 789-973.
The cunner is listed (p. 885).

Jordan, D. S.
1891. A review of the labroid fishes of America and Europe. Rep. U. S. Comm. Fish Fish. for 1887, 15: 599—699.
A taxonomic description and synonomy is provided. The habitat of this species is given as "Atlantic coasts of North America, from Labrador to New York." "This little fish is exceedingly abundant about rocks and wharves near shore in the regions where it is found. It reaches a length of about 10 inches, being too small to have much value as food. . ." p. 624. The fish is also noted as being a pest to fishermen by "nibbling" bait from hooks.

Jordan, D. S.
1905. A guide to the study of fishes. Holt and Co., New York. 599 pp.
"With this, *[Tautoga onitis]* and still more abundant, is the cunner or chogset, *Tautogolabrus adspersus*, greenish-blue in color, the flesh being also more or less blue. This fish is too small to have much value as food, but it readily takes the hook set for better fishes." p. 387.

Jordan, D. S.
1917—1920. The genera of fishes. Stanford Univ. Ser, 4 Parts.
The four parts are as follows: Part I, 1917, pp. 1-161; Part II, 1919, pp. 163-284; Part III, 1919, pp. 285-410; Part IV, 1920, pp. 411-576. *Tautogolabrus* is listed (p. 318) as one of the genera described by Günther (1861).

Jordan, D. S.
1923. A classification of fishes including families and genera as far as known. Stanford Univ. Publ. Univ. Ser., Biol. Sci., Vol. 3(2): 77-243.
Tautogolabrus is listed (p. 221) as one of the genera in the family Labridae.

Jordan, D. S.
1925. Fishes. D. Appleton Co., New York. 773 pp.
The abundance of the cunner on the coast of New England is noted (p. 598).

Jordan, D. S.
1929. Manual of the vertebrate animals of the northeastern United States. 13th ed. World Book Co., New York. 446 pp.
The taxonomic description is given (p. 186). Distribution of the cunner is cited as Newfoundland to Virginia.

Jordan, D. S., and B, W. Evermann.
1896. A checklist of the fishes and fish-like vertebrates of North and Middle America. Rep. U. S. Comm. Fish., for 1895, 21, Append. 5: 207-584.
The fish occurs on the "Atlantic coasts of North America, from Labrador to Sandy Hook." p. 411.

Jordan, D. S., and B. W. Evermann.
1896—1900. The fishes of North and Middle America. Bull. U. S. Nat. Mus., 47(1-4): 1-3313.
The taxonomic description and synonomy is given (p. 1577).

Jordan, D. S., and B. W. Evermann.
1916. American food and game fishes. A popular account of all of the species found in America north of the equator, with keys for ready identification, life histories and methods of capture. Doubleday, Page Co., New York. 572 pp.
The fish is referred to (p. 476—477) as "one of the best known fishes on our North Atlantic Coast from Labrador to Sandy Hook."

Jordan, D. S., B. W. Evermann, and H. W. Clark.
1930. Checklist of the fishes and fish-like

vertebrates of North and Middle America north of the northern boundary of Venezuela and Columbia. Rep. U. S. Comm. Fish. for 1955. U. S. Fish and Woldl. Serv., Wash., D.C. 670 pp.)
C. 670 pp.)
The taxonomic synonomy of the cunner is listed (p. 424).

Jordan, D. S., and C. H. Gilbert.
1882. Synopsis of the fishes of North America. Bull. U. S. Nat. Mus., 16: 1-1018.
A brief description of the cunner is provided (p. 599). The distribution of the species is given as Newfoundland to Cape Hatteras.

Kendall, W. C.
1908. Fauna of New England. List of the Pisces. Occ. Pap., Boston Soc. Natur. Hist., 7(8): 1-152.
The localities in New England where cunner *(Ctenolabrus ceruleus)* occur are listed (p. 109).

Kendall, W. C.
1909. The fishes of Labrador. Proc. Portland Soc. Natur. Hist., 2(8): 207-243.
Kendall notes that Jordan and Evermann (1896) list the cunner as occurring in Labrador and that his list is based upon their observations.

Kendall, W. C.
1914. An annotated catalogue of the fishes of Maine. Proc. Portland Soc. Natur. Hist., 3(1): 1-198.
The localities in Maine where cunner were cited are reported (p. 55-56).

Kidder, J. H.
1880. Report of experiments upon the animal heat of fishes, made at Provincetown, Mass., during the summer of 1879, in connection with operations of the United States Fish Commission. Proc. U. S. Natl. Mus., 2: 306-326.
Experiments on the internal temperatures of fishes were performed. A thermometer inserted in the stomach of cunner read 1.2° F above ambient water temperature.

Kingsley, J. S., and H. W. Conn.
1883. Some observations on the embryology of the teleosts. Mem. Boston Soc. Natur. Hist., 3(6): 183-212.
A detailed account of the development of the cunner egg.

Kuntz, A., and L. Radcliffe.
1917. Notes on the embryology and larval development of twelve teleostean fishes. Bull. U. S. Bur. Fish., 35: 89-134.
A description of the spawning, eggs, embryology, and larval development of the cunner is provided. Also contained within this report are figures of the developing eggs and larvae of the cunner, as well as a key to the fish eggs which occur within the Woods Hole region during July and August.

Laird, M., and W. L. Bullock.
1969. Marine fish haematozoa from New Brunswick and New England. J. Fish. Res. Bd. Canada, 26(4): 1075-1102.
Seven cunner examined yielded no signs of blood parasites.

Lebida, R. C.
1969. The seasonal abundance and distribution of eggs, larvae, and juvenile fishes in the Weweantic River estuary, Massachusetts, 1966. M. S. thesis, Univ. Mass., 59 pp.
Cunner eggs were obtained from plankton tows in June 1966. Cunner and tautog eggs comprised the bulk of eggs identified from plankton net hauls. Nearly all (98%) of the cunner eggs obtained were from the lower portion (high salinity) of the Weweantic Estuary.

Lee, C. F.
1948. Thiaminase in fishery products: A review. Comm. Fish. Rev., 10(4): 7-17.
Reference is made to the work of Yudkin (1945) in which the cunner was investigated for thiaminase occurrence.

Legendre, V., [ed.].
1964. French and English names of the Canadian Atlantic fishes. Quebec Service De La Faune Rapport No. 2: 1-178.

The French and English names of the cunner, (tanche-tautogue; cunner) and several references to Canadian publications citing this species are provided (p. 78).

Leim, A. L., and L. R. Day.
1959. Records of uncommon and unusual fishes of eastern Canadian waters, 1950-1958. J. Fish. Res. Bd. Canada, 16(4): 503-514.
"A record sized, male specimen, 44 cm (17 1/4 in.) long and weighing 3 1/4 pounds, was caught off Head Harbour, Campobello N. B., September 9, 1953." p. 512.

Leim, A. L., and W. B. Scott.
1966. Fishes of the Atlantic Coast of Canada. Fish. Res. Bd. Canada, Bull. 155. 485 pp.
A complete natural history of the cunner is given (p. 269-270). Included within this account is information pertaining to the description, common names, distinctions, size range, and biology and economics of the cunner. References are provided for reports relating to the Canadian distribution of the cunner.

Linsley, J. H.
1844. Catalogue of the fishes of Connecticut, arranged according to their natural families; prepared for the Yale Natural History Society. Amer. J. Sci. Arts, 47: 55-80.
"There is a great variety of coloring in the *burgall*, and this has doubtless induced Dr. DeKay to constitute his new species, '*uninotatus;*' specimens of which may always be taken in any large collection of the *true species*, and of which we doubtless have but one, as indicated by Dr. Storer." p. 66.

Linton, E.
1901a. Fish parasites collected at Woods Hole in 1898. Bull. U. S. Fish. Comm. for 1899, 19: 267-304.
Examination of 22 cunners obtained during August and September revealed that most of fish were infected with cestode and trematode cysts. The "immature distoma" encysted within the skin of the cunner are described and confirm the earlier findings of Ryder (1884) concerning trematode cysts.

Linton, E.
1901b. Parasites of fishes of the Woods Hole region. Bull. U. S. Fish. Comm. for 1899, 19: 405-492.
The nematode, cestode and trematode parasites of the cunner are enumerated. Also listed are the various food items found in cunner stomachs; - seaweed, hydroid stems, bryozoa, tunicates, small crustaceans of various kinds *(Caprella*, shrimps, etc.) and univalve mollusks.

Linton, E.
1910. Notes on the flesh parasites of marine food fishes. Bull. U. S. Fish. Comm. for 1908, 28, Pt. 2: 1195-1210.
The cunner is noted (p. 1199-1200) as usually possessing small distomes encysted in the skin and in the fins. These parasites are considered as unlikely to infect humans since they are usually removed in preparing the fish for cooking.

Linton, E.
1915. *Tocotrema lingus* (Creplin). The adult stage of a skin parasite of the cunner and other fishes of the Woods Hole region. J. Parasit., 1: 128-134.
Cunners are frequent hosts of the cyst stage of *Tocotrema lingus.*

Linton, E.
1928. Notes on trematode parasites of birds. Proc. U. S. Natl. Mus., 73(1929): 1-36.
The trematode *Cryptocotyle lingua* is noted to be found "Encysted in gills, fins, and skin of *Ctenolabrus adspersus*, *Tautoga onitis*, and other species of fish." p. 19.

Linton, E.
1934. Some observations on the distribution of helminth Entozoa of fishes of the Woods Hole region (Massachusetts, U. S. A.). *In* R. J. Daniel [ed.], James Johnstone Memorial Volume, University Press, Liverpool: 121-131.
The cunner is commonly parasitized by the trematode metacercariae of *Cryptocotyle lingua.*

Linton, E.
1940. Trematodes from fishes mainly from

the Woods Hole region, Massachusetts. Proc. U. S. Natl. Mus., 88(3078): 1-172.
Cunner is listed as a host for the following parasites: *Cymbephallus vitellosus*, *Lepocreadium trullaforme*, *Hemiurus appendiculatus*, *Lecithaster confusus*, and *Cryptocotyle lingua*. An expanded account of *C. lingua* infection of the cunner is presented (p. 156-157).

Linton, E.
1941. Cestode parasites of teleost fishes of the Woods Hole region. Massachusetts. Proc. U. S. Natl. Mus., 90 (3112): 417-442.
The cestode *Bothriocephalus* is listed as a parasite of cunners.

Loeb, J.
1895. Untersuchungen uber die physiologischen Wirkungen des Sauerstoffmangels. Pfluger's Arch., 62: 249-294.
Cited in Phillips (1940) as working with cunner eggs.

Loeb, J.
1912. Heredity in heterogeneous hybrids. J. Morphol., 23(1): 1-16.
Attempts were made to hybridize cunner eggs with sperm of scup and mummichog and mummichog eggs with cunner sperm. None of the crosses succeed in hatching.

Loomis, F. B., and D. B. Young.
1912. On the shell heaps of Maine. Amer. J. Sci., 34(199): 17-42.
Thirty-two cunners were found in a shell heap on Flagg Island and one cunner on a shell heap on Seaward Island.

Lugger, O.
1877. Additions to list of fishes of Maryland, published in report, January 1, 1876. Rep. Comm. Fish. Maryland: 57-94.
Cited in Hildebrand and Schroeder (1928) as recording the occurrence of the cunner in Worcester and adjoining counties, Maryland.

Lux, F. E., and F. E. Nichy.
1971. Number and lengths, by season, of fishes caught with an otter trawl near Woods Hole, Massachusetts, September 1961 to December 1962. U. S. Dept. Commerce, Nat. Mar. Fish. Serv., Spec. Sci. Rep. Fish. No. 662. 15 pp.
"Cunners were caught from September to early December in 1961 and from late March through November in 1962. . . They were rare or absent during the coldest months. This species spawns in spring and early summer, and the fish 30 to 59 mm. long in 1961 were judged to be young of the year. In 1962, the 0-group fish appeared in catches in early July at lengths of 17 to 27 mm and were present through November. Cunners caught from late March through June in 1962 probably were 1-group fish; however, from July to early September fish older than 1-group also appeared to be present." p. 9-10.

McAllister, D. E.
1960. List of the marine fishes of Canada. Bull. Nat. Mus. Canada, Biol. No. 168: 1-76.
The cunner is listed.

McConnaughey, B. H.
1970. Introduction to marine biology. The C. V. Mosby Co., St. Louis. 449 pp.
"A few exceptional species (wrasses) are found outside the tropics and become larger than most species. The blackfish, or tautog *(Tautoga onitis)*, of the United States Atlantic coast and the burgall, or cunner *(Tautogolabrus adspersus)*, which extends as far north as Labrador, are examples." p. 151.

McErlean, A. J.
1963. Aquarium behavior of juvenile labrid fishes. Copeia, 1963 (1): 186.
Observations of one cunner held in an aquarium with six tautog for two weeks yielded information on cunner territoriality. A detailed description of the animal's behavior is provided.

McKenzie, R. A.
1959. Marine and freshwater fishes of the Miramichi River and Estuary, New Brunswick. J. Fish. Res. Bd. Canada, 16(6): 807-829.
"Called 'blue-perch' by many, this species

is common throughout the tidal parts of the Miramichi." p. 827.

McClane, A. J.
1954. The wise fishermen's encyclopedia. Wm. H. Wise Co., New York. 1336 pp.
The general life history and distribution is presented together with fishing techniques.

McClane, A. J.
1965. McClane's standard fishing encyclopedia. Holt, Rinehart and Winston, New York. 1057 pp.
A description of the fish, its life history and its angling value is presented.

Mackmull, G., and N. A. Michels.
1932. Absorption of colloidal carbon from the periotoneal cavity in the teleost, *Tautogolabrus adspersus*. Amer. J. Anat., 51: 3-39.
Experiments utilizing the cunner demonstrated "that intraperitoneally injected carbon reaches various organs and tissues, a) as free ink granules, b) by direct infiltration of carbon-filled cells, i. e., macrophages derived from the peritoneal cavity, and, c) by migration of carbon-filled macrophages from vascular channels. Direct absorption of free carbon particles from the peritoneal cavity is accomplished chiefly by the mesentary and intestine, the muscular coat of the latter being frequently invaded by bay-like projections of carbon." p. 31.

Marak, R. R., and J. B. Colton.
1961. Distribution of fish eggs and larvae, temperature, and salinity in the Georges Bank - Gulf of Maine area, 1953. U. S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. No. 398, 61 pp.
Cunner eggs and larvae were obtained in plankton tows using a meternet and a "Hardy plankton sampler" from May 25, 1953 to June 3, 1963.

Marak, R. R., J. B. Colton, and D. B. Foster.
1962. Distribution of fish eggs and larvae, temperature and salinity in the Georges Bank - Gulf of Maine area, 1955. U. S. Fish Wildl. Serv., Spec. Sci. Rep. Fish No. 411, 66 pp.
Four cunner eggs were obtained on May 28, 1955 from the surface plankton using a "Hardy plankton recorder".

Marak, R. R., J. B. Colton, Jr., D. B. Foster, and D. Miller.
1962. Distribution of fish eggs and larvae, temperature, and salinity in the Georges Bank - Gulf of Maine area, 1956. U. S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. No. 412, 95 pp.
Cunner eggs and larvae were obtained from surface plankton hauls during the spring of 1956. Both a surface-towed meter net and a continuous Hardy plankton recorder were utilized in the plankton operations.

Meek, A.
1916. The migrations of fish. Edward Arnold, London. 427 pp.
The observation is made that cunner eggs are pelagic and that, in this respect, they resemble the eggs of related wrasses such as the "goldsinny rainbow wrasse, and tautog." p. 307.

Mélancon, C.
1958. Les poissons de nos eaux. Troisiéme édition, avec addenda. La Société zoologique de Quebec, Quebec. 258 pp.
The cunner is cited (p. 230).

Merriman, D.
1947. Notes on the midsummer ichthyofauna of a Connecticut beach at different tide levels. Copeia, 1947(4): 281-286.
Seine-hauls at Bushnell Beach, Pine Orchard, Connecticut during the latter part of July and early August, 1943 and 1944 yielded cunners in only two sets.

Merriman, D., and R. C. Sclar.
1952. Hydrographic and biological studies of Block Island Sound. The pelagic eggs and larvae of Block Island Sound. Bull. Bingham Oceanogr. Coll., 13(3): 165-219.
The eggs and larvae of the cunner are discussed. Attention is focused upon abundance, spawning period, distribution, etc. A key to the eggs and larvae of Block Island Sound is provided.

Merriman, D., and H. E. Warfel.
1948. Studies on the marine resources of southern New England. VII. Analysis of a fish population. Bull. Bingham Oceanogr. Coll., 11(4): 131-164.
Cunner is listed in tables concerning the occurrence of fish species in one-hour trawl hauls taken during 1943-1946.

Mitchill, S. L.
1814. Report, in part, of Samuel L. Mitchill, M. D., on the fishes of New York, New York. 28 pp.
Cunner is cited (p. 23-24) as *Tautoga niger* and *Tautoga coerulea.*

Mitchill, S. L.
1815. The fishes of New York described and arranged. Trans. Lit. Phil. Soc. N. Y., 1: 355-492.
A description of the cunner *(Labrus chogset* and *Labrus chogset fulva)* and its habits are presented (p. 402-403).

Moenkhaus, W. J.
1904. The development of the hybrids between *Fundulus heteroclitus* and *Menidia notata* with especial reference to the behavior of the maternal and paternal chromatin. Amer. J. Anat., 3: 29-66.
"The eggs of *Fundulus heteroclitus* can very easily be impregnated by *Tautogolabrus adspersus.* The eggs of the former cleave ordinarily in about two hours after the addition of sperm. Those of the latter under similar conditions, cleave in about fifty minutes. In the hybrid, however, the rapid sperm is unable to alter the rate of cleavage and vice versa. This law is strikingly illustrated in the cross between *Batrachus tau* and *Tautogolabrus.*" p. 36.

Morgan, T. H.
1895. The formation of fish embryo. J. Morphol., 10: 419-473.
Reference is frequently made to the embryology of *Ctenolabrus.*

Morris, M.
1914. The behavior of the chromatin in hybrids between *Fundulus* and *Ctenolabrus.* J. Exp. Zool., 16(4): 501-521.
The cytology of hybrids developing from mummichog eggs and cunner sperm is discussed in depth with particular attention devoted to the behavior of the chromosomes.

Morrow, J. E., Jr.
1951. The biology of the longhorn sculpin, *Myoxocephalus octodecemspinosus* Mitchill, with a discussion of the Southern New England "trash" fishery. Bull. Bingham Oceanogr. Coll., 13(2): 1-89.
The cunner is listed as a food item found in the stomachs of longhorn sculpin collected in February 1944 (p. 89).

Murawski, W. W.
1970. Study of the ichthyoplankton associated with two of New Jersey's coastal inlets. N. J. Div. Fish Game Shellfish, 34 pp.
The distribution and occurrence of cunner eggs and larvae obtained by plankton nets during 1968-1970 is documented.

Nalbant, T. T.
1967. Fish collected by the trawler 'Galati' in the northwest Atlantic (Georges Bank). Buletinul Institutului de Cercetari Piscicole, 26: 41-53.
Cited in Zoological Record. Cunner was one of the species of fish collected. In Romanian with French and Russian summaries.

Needler, A. W. H.
1940. A preliminary list of the fishes of Malpeque Bay. Proc. Nova Scotian Inst. Sci., 20(2): 33-41.
Small cunners, locally called 'perch', were common throughout the bay and were seined from the mouth of the bay to the creeks. None larger than 13.5 cm were taken.

Nelson, J.
1890. Descriptive catalogue of the vertebrates of New Jersey, p. 481-824. *In* J. Nelson [ed.], Geological survey of New Jersey. Part 2. Vol. 2.
A taxonomic description of the cunner is listed (p. 743).

Newman, H. H.
1914. Modes of inheritance in teleost hybrids. J. Exp. Zool., 16(4): 447-499.
References and reviews the work of Appellöf (1894) on teleost hybrids. Appellöf attempted to cross the cod and the cunner.

Newman, H. H.
1915. Development and heredity in heterogenic teleost hybrids. J. Exp. Zool., 18(4): 511-576.
Newman performed the following hybrid crosses: cunner sperm with the eggs of *Fundulus heteroclitus; Fundulus diaphanus; Cyprinodon variegatus; Gasterosteus aculeatus; Apeltes quadracus; Menidia menidia notata; Stenotomus chrysops;* and cunner eggs with the sperm of *F. heterclitus; F. majalis; A. quadracus; M. menidia notata; M. beryllina cerea; Poronotus triacanthus;* and *S. chrysops.*

New York State Conservation Department.
Undated. Fish & fishing in New York. 36 pp.
"Cunner. A small, colorful fish abundant over rocky bottoms and around docks and piers. Hardly anyone fishes for them; nearly everyone catches them. Take 'em or leave 'em." p. 22.

Nichol, J. A. C.
1967. The biology of marine animals. Sir Isaac Pitman Sons, Ltd., London. 699 pp.
The cunner is listed as exhibiting an oxygen consumption of 108—126 cc. O_2/kg—hour at 18° C. The rapidity with which color changes are accomplished is also noted.

Nichols, J. T.
1913. A list of fishes known to have occurred within fifty miles of New York City. Abst. Linn. Soc. N. Y. for 1907—1911, 20—23: 90-106.
The cunner is listed.

Nichols, J. T.
1918. Fishes of the vicinity of New York City. Amer. Mus. Natur. Hist., Handbook Ser., No. 7: 1-118.
An account (p. 80-81) of the habits of the cunner and a description of the fish are provided.

Nichols, J. T., and C. M. Breder, Jr.
1927. The marine fishes of New York and southern New England. Zoologica, 9(1): 1-192.
A brief account (p. 129) of the distribution, habits and life history of the cunner is presented.

Norman, J. R.
1966. A draft synopsis of the orders, families and genera of recent fishes and fish-like vertebrates. Trustees of the British Museum, London. 649 pp.
Tautogolabrus is listed (p. 353).

Norman, W. W.
1896. Segmentation of the nucleus without segmentation of the protoplasm. Archiv für Entwicklungsmechanik der Organismus, 3: 106—126.
Cunner eggs were used as experimental material to ascertain the effects of increased temperature on the segmentation of the protoplasm.

Ogren, L., and J. Chess.
1969. A marine kill on New Jersey wrecks. Underwater Natur., 6(2): 4-12.
A mortality of marine organisms was noted off the coast of southern New Jersey in the fall of 1968. Cunners were noted to be affected in the area of the wreck 'Delaware.' "They were lying on the upper part of the wreck, curled or pressed into crevices. They exhibited blotchy pigmentation, gaping mouths, and erect fins. Some of these cunner would swim in a disoriented manner when disturbed. No live cunner were found on the 'Delaware' three weeks after the first stress symptoms were observed. The absence of large numbers of dead fish suggests that the majority of cunner moved off the wreck." p. 5.

Orlowski, S. J., S. S. Herman, R. G. Malsberger, and H. N. Pritchard.
1972. Distinguishing cunner and tautog eggs by immunodiffusion. J. Fish. Res. Bd. Canada 29(1): 111-112.
An immumodiffusion technique is described which enables eggs of the cunner

and tautog to be distinguished within three hours.

Orton, G. L.
1953. Development and migration of pigment cells in some teleost fishes. J. Morphol., 93(1): 69-100.
The pattern of larval development of the señorita, *Oxyjulis californica*, is noted to be similar to that of the cunner.

Osburn, R. C.
1921. Bryozoa as food for other animals. Science, N. S., 53(1376): 451-453.
"Certain fishes that habitually browse around ledges, rocks, wharves, etc., and which have teeth adapted for cutting off and crushing the shells of their prey, are known to include Bryozoa in their diet with some regularity. Thus, the cunner, *Tautogolabrus adspersus*, and the blackfish or tautog, *Tautoga onitis*, feed on bryozoa along with other hardshelled organisms." p. 452.

Parker, G. H.
1903. The optic chiasma in teleosts and its bearing on the asymmetry of the heterosomata (flat fishes). Bull. Mus. Comp. Zool., Harvard Univ., 40: 219-242.
Cunner was one of ten species of fish examined "to ascertain whether the right nerves or the left nerves are more usually dorsal at the chiasmata of symmetrical teleosts. . ." p. 222.

Parker, G. H.
1912. Sound as a directing influence in the movement of fishes. Bull. U. S. Bur. Fish. 30: 97-104.
The distribution of fish in a large wooden tank was studied after allowing a 4300 g iron ball to strike the outside end of the tank. Cunner showed a tendency to move toward the sound center.

Parker, G. H.
1913. Effects of explosive sounds, such as those produced by motorboats and guns upon fishes. Rep. U. S. Fish Comm. for 1911: 1-9.
The sounds of a motor boat altered the behavior of cunners. They ceased feeding while the running boat stood 6 ft. away from baited lines.

Pearce, J. B.
1969. Thermal addition and the benthos, Cape Cod Canal. Chesapeake Sci., 10(3,4): 227-233.
"Some preliminary work with the cunner *(Tautogolabrus adspersus)* indicates that changes occur in the blood tissues of this fish when it is exposed to elevated temperatures. As temperatures are increased the percent of red blood cells decreases. Further research is necessary to substantiate these findings. Again, however, cunner are usually found in depths lower than those predicted by consulting engineers to be adversely heated by discharged waters." p. 229.

Pearcy, W. G., and S. W. Richards.
1962. Distribution and ecology of fishes in the Mystic River estuary, Connecticut. Ecology, 43(2): 248-259.
Cunner eggs, larvae, juveniles and adults were collected as part of a general investigation of the ichthyofauna. Labrid eggs were collected between April and August and were the most abundant pelagic eggs collected in the estuary. No differences in vertical distribution of either the eggs or larvae were apparent although both stages were noted to be more common in the lower estuary.

Perley, M. H.
1852. Descriptive catalogue (in part) of the fishes of New Brunswick and Nova Scotia. Rep. Sea River Fish. New Brunswick, Frederiction. 294 pp.
The occurrence of the cunner in Canadian waters is documented (p. 190).

Perlmutter, A.
1939. A biological survey of the salt waters of Long Island, 1938. Section II. An ecological survey of young fish and eggs identified from tow-net collections. Suppl. 28th Ann. Rep. N. Y. Conserv. Dept., Pt. 2: 11-71.
"Several thousand eggs were taken from

May through September. . . (although) the height of spawning is reached in June. . . During July and August, the Griek trawl, picked up two size groups of cunners. One group, from 15 to 34 mm, represented young of the year whereas the second group from 45 to 89 mm probably were in their second year." p. 28.

Perlmutter, A.
1961. Guide to marine fishes. Bramhall House, New York. 431 pp.
A short description of the color, distribution, general information, and economic importance of the cunner is provided (p. 393-394).

Philips, F. S.
1940. Oxygen consumption and its inhibition in the development of *Fundulus* and various pelagic fish eggs. Biol. Bull. (Woods Hole), 78(2): 256-274.
The respiration of the cunner egg during the first several days of development and its sensitivity to NaCN and NaN_3 were investigated. The results indicate that cunner eggs are quite sensitive to anaerobic conditions and cease development almost immediately upon exposure to respiratory poisons. These findings corroborate observation of Loeb (1895).

Pinney, E.
1918. A study of the relation of the behavior of the chromatin to development and heredity in teleost hybrids. J. Morphol., 31(2): 225-292.
Investigation of the developmental and cytological processes occurring in hybrid crosses between the cunner and *Fundulus*, *Menidia*, and *Stenotomus*.

Pinney, E.
1922. The initial block to normal development in cross-fertilized eggs. I. Crosses with the egg of *Fundulus*. II. Reciprocal crosses between *Ctenolabrus* and *Prionotus*. J. Morphol., 36(3): 401-420.
An additional investigation of the behavior of chromatin in teleost hybrid eggs. A tabular summary of the data on the crosses performed is presented. "The first cleavage mitosis depends upon certain specific physical conditions of the substratum, namely the egg protoplasm." p. 402.

Prince, E. E.
1917. On serially striped haddock in New Brunswick. Contrib. Canadian Biol. for 1915-1916- 86-91.
"The young forms (cunner) exhibit the transverse bars, eight or nine dark ochre bands richly spotted with black dots, extending from the head region to the base of the tail, when the fish is barely half-an-inch long." p. 89.

Provancher, A.
1875. Faune Canadien. Les poissons. Le Naturaliste Canadien, 7: 758.
A description of the cunner and an account of its occurrence is provided.

Putnam, F. W.
1863. List of the fishes sent by the museum to different institutions, in exchange for other specimens, with annotations. Bull. Mus. Comp. Zool., Harvard Univ., 1: 2-16.
The cunner is listed.

Radcliffe, L.
1922. Fisheries of the New England States in 1919. Rep. U. S. Comm. Fish. for 1921, Append. 5: 120-187.
Tables of catch and market statistics are given throughout text.

Ransom, B. H.
1920. Synopsis of the trematode family Heterophyidae with descriptions of a new genera and five new species. Proc. U. S. Nat. Mus., 57: 527-573.
The cunner is listed as a host for the cyst stage of *Cryptocotyle lingua*.

Rathbun, R.
1893. Report upon the inquiry respecting food-fishes and the fishing ground. Rep. U. S. Comm. Fish Fish. for 1889 to 1891, 17: 97-171.
"The eggs of the cunner are buoyant and very transparent; about 26 are contained

in a linear inch. About 50,000 eggs of this species obtained May 22, 1890, were hatched at Woods Hole on the 5th day, with a loss of only 5,000. The tidal cod jar was used, the temperature of the water being 56° F." p. 160.

Ravenel, W. DeC.
1901. Report on the propagation and distribution of food-fishes. Rep. U. S. Comm. Fish Fish. for 1900: 25-118.
The cunner is listed (p. 55) as one of the salt-water fishes exhibited at the aquarium at Central Station in Washington, D. C. during the fiscal year ending June 1900.

Ray, C., and E. Ciampi.
1956. The underwater guide to marine life. A. S. Barnes Co., New York. 338 pp.
"The cunner (bergall), *Tautogolabrus adspersus* is the most northern wrasse. . . It reaches 15 inches and ranges from Labrador to the Chesapeake." p. 256.

Reid, M. E.
1929. The distribution and development of the cunner (*Tautogolabrus adspersus* Walbaum) along the eastern coast of Canada. Contrib. Canadian Biol., 4(27): 431-441.
Plankton tows were accomplished during the summer of 1971 at Miramichi Bay and Passamaquoddy Bay, New Brunswick; Cheticamp, Shelburn, and St. Mary Bay, Nova Scotia. Differences in spawning season and abundance of cunner eggs and larvae between the various localities is attributed to water temperature.

Richards, C. E., and M. Castanga.
1970. Marine fishes of Virginia's eastern shore (inlet and marsh, seaside waters). Chesapeake Sci., 11(4): 235-248.
Juveniles clung to tiles placed in mid-marsh areas for oyster drill studies and they remained on the tiles even though lifted from the water.

Richards, S. W.
1959. Oceanography of Long Island Sound. VI. Pelagic fish eggs and larvae. Bull. Bingham Oceanogr. Coll., 17(1): 95-124.
Eggs and larvae were sampled using a Clarke-Bumpus sampler from March 1954 to November 1955. Eggs and larvae were obtained from May - September 1954, and June-August 1955. The delayed appearance of specimens in 1955 was attributed to the time of sampling rather than temperature. No significant difference in sizes of cunner eggs was noted from various localities in L.I.S., but the average cunner egg diameter decreased through the summer.

Richards, S. W.
1963a. The demersal fish population of Long Island Sound. I. Species composition and relative abundance in two localities, 1956-57. Bull. Bingham Oceanogr. Coll., 18(2): 1-31.
Trawl hauls were taken in L.I.S. from June 1955 to July 1957. Cunner were obtained seasonally at both stations, usually in the warmer months but never in midwinter.

Richards, S. W.
1963b. The demersal fish population of Long Island Sound. II. Food of the juveniles from a sand-shell locality. Bull. Bingham Oceanogr. Coll., 18(2): 32-72.
"Twenty-four cunners, zero to fourth year, caught in spring, summer and fall, ate 18 identifiable prey, of which crustaceans, primarily motile amphipods, were the most important. Small cunners exhibited less over-all evidence of bottom feeding than did the larger specimens. Occasional polychaetes did not form an important segment of the diet, and small numbers of copepods were consumed only by the 0-year class. Occasional mysids (2-3 mm), shrimps (5.6-16.0 mm), crabs, and mollusks were primarily eaten by the older cunners. Ten percent of the total caprellids was consumed by 11 cunners, while hydroids, in which caprellids live, were eaten only by cunners from 94 to 138 mm. Very small cunners were apparently able to select the amphipods from the hydroids, whereas the older cunners were not able to do so. The only specimen of *Orchomenella* was eaten by a cunner 37 mm long. Empty stomachs occurred infrequently and at no particular season." pp. 55-56.

Richards, S. W.
1963c. The demersal fish population of Long Island Sound. III. Food of the juveniles from a mud locality. Bull. Bingham Oceanogr. Coll., 18(2): 73-101.
Data on the food found in cunner stomachs is presented (p. 78, 98).

Richardson, J.
1837. Report on North-American zoology. Rep. British Ass. Adv. Sci. 5: 121-224.
Cunner *(Labrus coricus)* is listed (p. 208) as a North-American labrid.

Rosenbaum, S.
1968. Collecting for a salt-water aquarium. Underwater Natur. 5(3): 33-37.
The aquarium behavior of the cunner is described as "same habits as blackfish, but is a smaller fish. Quite timid as it gets larger and correspondingly more difficult to feed." p. 35.

Ryder, J. A.
1884. On a skin parasite of the cunner *(Ctenolabrus adsperus)*. Bull. U. S. Fish. Comm., 4: 37-42.
Larval flukes were found in the skin, fins, and gills. A discussion on the pathological affects produced by these cysts (presumably metacercaria of *Cryptocotyle lingua*, — see Stunkard, 1930) is provided. Attention is focused on the development of pigment cells adjacent to the cysts.

Safford, V.
1940. Asphyxiation of marine fish with and without CO_2 and its effect on the gas content of the swimbladder. J. Cell. Comp. Physiol., 16: 165-173.
Experiments were conducted to determine how the respiratory changes at the gills influence the exchange of oxygen and carbon dioxide at the swimbladder. The swimbladder of the cunner was found to lose 82% of the oxygen content normally contained therein when fish were subjected to asphyxiation with little carbon dioxide in the water.

Sands, B.
1971. Mercury monitoring highlights Long Island swordfish tournament. N. Y. Conserv., 26(2): 27-31.
One cunner possessed 0.22 ppm mercury.

Sargent, P. E.
1898. The giant ganglion cells in the spinal cord of *Ctenolabrus coeruleus*. Anatomischer Anzeiger, 15: 212-225.
The 35 to 40 giant ganglion cells lying in the dorsal fissure of the spinal cord of the cunner are described.

Sargent, P. E.
1900. Reissner's fibre in the canalis centralis of vertebrates. Anatomischer Anzeiger, 17(2-3): 33-44.
The Reissner's fibre in the cunner is described.

Sargent, P. E.
1903. The torus longitudinalis of the teleost brain: its ontogeny, morphology, phylogeny, and function. Mark Anniversary Vol. 20: 399-416.
A description of the torus longitudinalis of the cunner is provided.

Sargent, P. E.
1904. The optic reflex apparatus of vertebrates for short-circuit transmission of motor reflexes through Reissner's fiber; its morphology, ontogeny, phylogeny, and function. Pt. I. The fishlike vertebrates. Bull. Mus. Comp. Zool. Harvard Univ., 45(3): 127-259.
The optic reflex apparatus of the cunner is described with accompanying figures (p. 212-215).

Schaefer, R. H.
1967. Species composition, size and seasonal abundance of fish in the surf waters of Long Island. N. Y. Fish Game J., 14(1): 1-46.
Only two cunners were obtained in seining operations at Fire Island, New York, between July 1961 and November 30 in 1961, between May 1 and October 31, in 1962, and between May 1 and November 30 in 1963.

Scholander, P. F., C. L. Claff, C. T. Teng, and V. Walters.

1951. Nitrogen tension in the swimbladder of marine fishes in relation to depth. Biol. Bull. (Woods Hole), 101(2): 178-193.
Cunner was one of 15 species of New England marine fishes analyzed for nitrogen tension in the swimbladder.

Scholander, P. F., and L. Van Dam.
1953. Composition of the swimbladder gas in deep sea fishes. Biol. Bull. (Woods Hole), 104(1): 75-86.
Analysis of the gas composition of the swimbladder is presented. The relation of gas composition in the swimbladders of cunners to total pressure is illustrated.

Schöpf, J.D.
1788. Beschreibung einiger nord-amerikanischen Fische vorzüglich aus den neu-yorkischen Gewässern. Schrift. Ges. Naturw. Freunde Berlin, 8: 138-194.
The cunner is cited (p. 155).

Schroeder, W. C.
1955. Report on the results of exploratory otter-trawling along the continental shelf and slope between Nova Scotia and Virginia during the summers of 1952 and 1953 p. 358-372. *In* Papers in Marine Biology and Oceanography, Deep-Sea Research; Vol. 3, Suppl.
The cunner is listed as one of the many species taken in the haul samples.

Schwartz, F. J.
1961. Fishes of Chincoteague and Sinepuxent Bays. Amer. Midl. Natur., 65(2): 384-408.
A single specimen captured in a crab pot at Parnell Bay in Chincoteague Bay November, 1959 is listed.

Schwartz, F. J.
1964. Fishes of the Isle of Wight and Assawoman Bays near Ocean City, Maryland. Chesapeake Sci., 5(4): 172-193.
The cunner is noted as a common summer and winter species (125-190 mm) found browsing on the pilings and jetties of Ocean City.

Scott, W. B. and M. G. Scott.
1965. A checklist of Canadian Atlantic fishes with keys for identification. Royal Ontario Museum, Univ. Toronto, Contrib. No 66. 106 pp.
The cunner is listed.

Serchuk, F.
1972. The ecology of the cunner, *Tautogolabrus adspersus* (Walbaum) (Pisces; Labridae), in the Weweantic River Estuary, Wareham, Massachusetts. M. S. thesis, Univ. Mass., 111 pp.
Various aspects of the life history of the cunner are described. Emphasis is placed upon age and growth of adults, the distribution, seasonal occurrence and abundance of egg and larval stages, and the occurrence and extent of trematode metacercarial parasitism on all life stages.

Sharp, B. and H. W. Fowler.
1904. The fishes of Nantucket. Proc. Acad. Nat. Sci. Phila., 56: 504-512.
Cunner is listed.

Shepard, D. C.
1961. A cytological study of the origin of melanophores in the teleosts. Biol. Bull. (Woods Hole), 120(2): 206-220.
"The pigment of the pelagic cunner egg is interesting because in similar embryos Orton (1953) and others have observed melanophores forming in the crest region well before any pigment cell migration." p. 213. Details of embryo pigmentation are described.

Sherwood, G. H. and V. N. Edwards.
1902. Notes on the migration, spawning, abundance, etc., of certain fishes in 1900. Bull. U. S. Fish. Comm. for 1901-1921: 27-31.
"Barrels of cunner were killed by the extreme cold of February, 1901, and were seen floating on the surface with tautog." p. 30.

Sindermann, C. J.
1970. Principal diseases of marine fish and shellfish. Academic Press, New York. 369 pp.
"Cercariae of *Cryptocotyle* invade and encyst in the fins and integument of herring, cunner, *Tautogolabrus adspersus*,

and a number of other inshore western Atlantic species, causing the formation of conspicuous cysts or 'black spots'." p. 53.

Smith, G. M.
1933. The mechanism of intake and outflow of fluids in the lateral line canal of fishes. Anat. Rec., 56(4): 365-368.
Cunner was one of many species investigated which failed to exhibit definite penetration of colored fluids into the lateral line canals.

Smith, H. M.
1894. Economic and natural history notes on fishes of the northern coast of New Jersey. Bull. U.S. Fish. Comm. for 1892, 12: 365-380.
The fish is found "throughout the fishing season" in pound nets catches. The largest examples weigh 1½ pounds. "Small examples were abundant in the dense vegetable growth which adheres to poundnet poles, ropes, anchors, etc. At Bradley Beach an old rope, covered with *Ulva lactuca lactuca* and *U. enteromorpha compressa*, when pulled up had hundreds of small cunners on it, which were landed in the boat. . ." p. 378.

Smith, H. M.
1898. Fishes found in the vicinity of Woods Hole. Bull. U. S. Fish. Comm. for 1897, 17: 85-111.
Cunner seasonal mortality is described in addition to breeding habits and distribution.

Smith, J. V. C.
1833. Natural history of the fishes of Massachusetts, embracing a practical essay on angling. Allen Ticknor, Boston. 399 pp.
Cunner life history is discussed (p. 259-261). Baird (1873) states of this publication "an exceptionally and even ludicrously erroneous and worthless compilation. . ."

Smith, J. V. C.
1835. A catalogue of the marine and freshwater fishes of Massachusetts, p. 535-538. In E. H. Hitchcock [ed.], Report on the Geology, Mineralogy, Botany and Zoology. Massachusetts, pt. 4.
Cunner, *Labrus coricus*, is listed.

Smith, J. Capt.
1616. The generall historie of Virginia, New England and the true travels, adventures, and observations and a sea grammar. 2 vols., London. Reprinted from the London edition of 1629 by the Franklin Press, Richmond, Va., 1819.
Smith comments on the abundance of fishes in New England and notes, "And in the harbors we frequented, a little boye might take of Cunners and Pinacks and such delicate fish, at the ships sterne, more than sixe or tenne can eate in a daie; but with a casting net, thousands when wee pleased. . ."

So, B. K. F.
1972. Marine fish haematozoa from Newfoundland waters. Canadian J. Zool. 50: 543-554.
Cunner was one of 28 species examined for haematozoa. None of the 26 cunners examined contained blood protozoa.

Speidel, C. S.
1922. Further comparative studies in other fishes of cells that are homologous to the large irregular glandular cells in the spinal cord of the skates. J. Comp. Neurol., 34(3): 303-318.
Cunner is listed as one of the many species of fish which were examined for Dahlgren cells. The cells found in the cunner exhibited lobulation of the nucleus and large cell body size.

Stafford, J.
1905. Trematodes from Canadian vertebrates. Zoologischer Anzeiger, 28: 631-694.
The cunner is cited as a host for *Dermocystis centolabri* (p. 682).

Stafford, J.
1907. Preliminary report on the trematodes of Canadian marine fishes. Contrib. Canadian Biol. for 1902-1905: 91-94.
Distomum sp. was encysted in skin of cunner.

Stafford, J.
1912. Fauna of the Atlantic coast of Canada. Contrib. Canadian Biol. for 1906-1910: 45-67.
The cunner is listed as one of the species of fish found in the mouth of the Gaspe Basin.

Stafford, J.
1917. Canada's fisheries as a source of food supply. Canadian Fisherman, August, 1917.
The abundance of the cunner in Canadian waters is noted.

Stearns, W. A.
1883. Notes on the natural history of Labrador. Proc. U. S. Natl. Mus., 6(6): 111-137.
The fish was very common all about Cape Britain.

Stock, V.
1915. On some parasitic copepods of the Bay of Fundy fish. Contrib. Canadian Biol. for 1911-1914: 69-71.
No caligid copepods were found on the one cunner examined.

Stone, R., and J. Clark.
1970. Artificial reef. Skin Diver, 19(7): 62-65.
The cunner was the most abundant of fish on an artificial reef built off Fire Island Inlet in 1962.

Storer, D. H.
1839a. Reports on the ichthyology and herpetology of Massachusetts. Zoological and botanical survey of the state. Reports on the fishes, reptiles and birds of Massachusetts. Boston J. Natur. Hist., 2(3-4): 289-558. (Reprinted 1839 Dutton, Wentworth, Boston, 426 pp.)
A report on the fishes of Massachusetts. A description and short natural history is of the cunner is provided. (p. 390-392)

Storer, D. H.
1839b. Remarks on the "Natural history of the fishes of Massachusetts, embracing a practical essay on angling; by Jerome V. C. Smith, M.D." Amer. J. Sci. Arts., 36(2): 337-349.
"Upon page 259, we have a description of the cunner, or marine perch as it is often called; and it is surprising that after the author observes, 'since the commencement of this little volume, no one species has given us more trouble and perplexity in the classification than this;' to find it arranged in a wrong genus, with the sage remark, 'to all appearance the perch or cunner is the tautog in miniature; and if it were black it would be supposed to be the young of that fish!' And this too, while the preoperculum of the former is strongly denticulated throughout, and the edge of that of the latter is per fectly smooth!" - p. 345.

Storer, D. H.
1846. A synopsis of the fishes of North America. Mem. Amer. Acad. Sci., N. S. 2(7): 253-550.
The taxonomic description and synonomy of the cunner is given (p. 386).

Storer, D. H.
1867. A history of the fishes of Massachusetts. Welsh, Bigelow, Dakin, and Metcalf, Boston. 287 pp. This report was reprinted from Mem. Amer. Acad. Arts Sci., 1853, N. S. 5 (part 1): 49-92, 122-168; (part 2): 257-296. 1858, N. S. (part 2): 309-372. 1863, N. S. 8 (part 2): 389-434. 1867, N. S. 9 (part 1): 217-256.
A taxonomic description with synonomy and remarks is provided (p. 108-110). The cunner, is noted to be a common species taken from the middle of June until late in October, and brought to market in immense quantities.

Storer, H. R.
1850. Observations on the fishes of Nova Scotia and Labrador, with description of new species. Boston J. Natur. Hist., 6(15): 247-270.
"Cuvier received specimens (of cunner) from Newfoundland; Dr. Storer next mentioning it as in the waters of Maine, whence it ranges southerly as far as New York. It is so plentiful in the Gut of Canso, that by sinking a basket with a salt fish tied therein for bait, we continually

caught them by the score; and by putting a few hundred into the 'well' of our little sloop, we kept ourselves, the dogs, and a hawk *(Falco Sancti Johannis)* well supplied with fresh fish wilst at sea." p. 264.

Stroud, R. H.
1971. Introduction to symposium, p. 1-8. In P. A. Douglas and R. H. Stroud [ed.], A symposium on the biological significance of estuaries. Sport Fishing Institute, Washington.
Cunner is listed as a species which is considered by some biologists to be estuarine-dependent at some critical stage in its life history.

Stunkard, H. W.
1930. The life history of *Cryptocotyle lingua* (Creplin), with notes on the physiology of the metacercariae. J. Morphol. Physiol., 50: 143-191.
Experiments were performed with trematode life stages obtained from cunners. Host relations and specificity of the trematode are presented on the basis of experimental data.

Suckling, J. A.
1967. Trunk lateral line nerves: some anatomical aspects p. 45-52. In P. Cahn [ed.]
Lateral line detectors. Indiana Univ. Press, Bloomington, Indiana.
Cunner is listed as one of many species of fish which have a "dorsal nerve present with commissures passing to lateralis nerve." p. 49. "Preliminary histological studies on the lateralis nerve of *Katsuwonus pelamis* and *Tautogolabrus adspersus* suggest that there are both large and small fibers present. The number appears to be of the order of 1000 fibers in the lateralis nerve, before it becomes part of the vagus." p. 51.

Sumner, F. B.
1906a. The osmotic regulations between fishes and their surrounding medium (preliminary note). Biol. Bull. (Woods Hole), 10(6): 298-306.
The cunner is not able to tolerate fresh water; the abruptness of transfer to low salinity and fresh water is not as important as the salinity level.

Sumner, F. B.
1906b. The physiological effects upon fishes of changes in the density and salinity of water. Bull. U. S. Bur. Fish. for 1905, 25: 53-108.
"Of the typically marine fishes few were tested as to their ability to withstand abrupt transfer to fresh water, since this is well known to result fatally in the case of most species. . . Some cunner *(Tautogolabrus adspersus)* were dead at the end of 12 hours. . ." p. 60. The following experiment was performed: "Thirteen cunners *(Tautogolabrus adspersus)* treated as were the fishes in the two preceding experiments. (Specimens transferred to fresh water through a series of daily steps of 0.001 in specific gravity. Fishes were fed throughout the experiment). All died within 12 hours after reaching fresh water though apparently healthy till this occurred." p. 65.

Sumner, F. B., R. C. Osburn and L. J. Cole.
1913. A biological survey of the waters of Woods Hole and vicinity. Pt. 1. Sec. 1. Physical and zoological. Pt. 2 Sec. 3. A catalogue of the marine fauna. Bull. U. S. Bur. Fish for 1911, 31: 5-441, 547-794.
Cunner is listed as one of the species obtained during the survey. A chart illustrating the distribution of the cunner in Vineyard Sound and Buzzards Bay is provided as well as a description of the food, parasites, and habits (p. 759-760).

Thomas, M. L. H. and G. H. White.
1969. Mass mortality of estuarine fauna at Bideford, P.E.I., associated with abnormally low salinities. J. Fish. Res. Bd. Canada, 26(3): 701-704.
"In May 1967 an up-estuary gale caused the buildup of an extra-ordinarily deep freshwater layer in Bideford River, P.E.I.; salinities at 3 m fell to less than $1^{o}/oo$." A single dead specimen of *Tautogolabrus adspersus*, the cunner, was noted after this phenomenon.

Thompson, H.
1932. First list of fishes in the Newfoundland fishing area. Ann. Rep. Newfoundl. Fish Res. Comm. for 1931, Append. 1(4): 107-110.
Young forms are taken pelagically at Bay Bulls.

Thompson, H.
1933. Second list of fishes in the Newfoundland fishing area. Ann. Rep. Newfoundl. Fish Res. Comm for 1932, Append. 2(1): 125-127.
Cunner is listed.

Thompson, H.
1934. Third list of fishes in the Newfoundland fishing area. Ann. Rep. Newfoundl. Fish Res. Comm for 1933, Append. 2(2): 115-117.
Cunner is listed.

Thomson, K. S., W. H. Weed, III, and A. G. Taruski.
1971. Saltwater fishes of Connecticut. State Geol. Nat. Hist. Surv. Conn., Bull. No. 105. 165 pp. A brief account of the field characters, color, description, size, distribution, habits, and importance of the cunner is provided (p. 131-132).

Threlfall, W.
1968. Studies on the helminth parasites of the American herring gull *(Larus argentatus)* in Newfoundland. Canadian J. Zool. 46(6): 1119-1126.
Although metacercariae of *Cryptocotyle lingua* parasitize the cunner, specimens of the fish were not found in the stomachs of gulls.

Townsend, C. H.
1901a. Report of the Division of Statistics and methods of the fisheries. Rep. U. S. Comm. Fish Fish. for 1900, 26: 163-184.
The cunner is listed.

Townsend, C. H.
1901b. Statistics of the fisheries of the New England States. Rep. U. S. Comm. Fish Fish. for 1900, 26: 311-386.
Catch statistics are listed throughout text.

Tracy, H. C.
1906. A list of the fishes of Rhode Island. I. Annotated list of the fishes known to inhabit the waters of Rhode Island. Ann. Rep. Rhode Island Comm. Inland Fish. for 1905, 36: 38-99.
A very brief account of the distribution, habitat, reproduction, food and size of the cunner is provided (p. 77-78).

Tracy, H. C.
1910. Annotated list of fishes known to inhabitat the waters of Rhode Island. Ann. Rep. Rhode Island Comm. Inland Fish. for 1909, 40: 35-176.
A description of the distribution, habitat, reproduction, food and rate of growth of the cunner is given (p. 135-136).

Tracy, H. C.
1911. The morphology of the swim-bladder in teleosts. Anatomischer Anzeiger, 38: 600-606; 638-649.
Cunner was one of nine species of marine fish in which the development of the swimbladder was studied.

Tracy, H. C.
1925. The relation of carbon dioxide to spontaneous movements in the larvae of *Opsanus tau*. Biol. Bull. (Woods Hole), 48(6): 408-431.
The spontaneous movements of the toadfish are compared to those of *Fundulus* and the cunner. "It would appear that the activity habits of these animals are not widely different at any stage of their existence, and are determined by some internal physiological mechanism, the earliest expression of which is found in the spontaneous movements of the embryo." p. 411.

Tracy, H. C.
1926. The development of motility and behavior reactions in the toad-fish. J. Comp. Neurol., 40(2): 256-369.
Observations are made in detail on the reactions, movements, and behavior of larval cunner. Larval cunner behavior is compared with that of the toadfish.

Tremblay, J. L.
1943. Rapport général sur les activités de la Station biologique du Saint-Laurent pendant les années 1936-1942. Univ. Laval. Stat. Biol., St. Laurent, Rapp. No. 4: 39-41.
The cunner is mentioned, p. 40.

Trumbull, J. H.
1873. On some early notices of New England fishes. Report on the condition of the sea fisheries of the south coast of New England in 1871 and 1972. Rep. U. S. Comm. Fish Fish. for 1871-1872: 165-169.
Usage of terms "cunner" and "bergall" for fish other than *Tautogolabrus adspersus* is discussed.

Unger, I.
1966. Artificial reefs - A review. Amer. Littoral Soc., Spec. Pub. No. 4, 74 pp.
A description of the occurrence of cunner in areas of artificial reefs.

Verrill, A. E.
1873. Report upon the invertebrate animals of Vineyard Sound and the adjacent waters, with an account of the physical characters of the region. *In* Report on the condition of the sea fisheries of the south coast of New England in 1871 and 1872. Rep. U. S. Comm. Fish Fish. for 1871-1872, 1: 295-778.
A cunner was observed to be in the stomach of a "Peaked-nosed Skate" caught in Vineyard Sound (p. 521). This occurrence was also recorded in Baird (1886).

Vladykov, V. D. and R. A. McKenzie.
1935. The marine fishes of Nova Scotia. Proc. Nova Scotian Inst. Sci., 19(1): 17-113.
Lists the cunner (p. 100) as very common in coastal waters but devoid of economic importance.

Walbaum, J. J.
1792. Petri artedi sueci Genera Piscium. Ichthyologiae Pars III. 723 pp. Reprinted 1966, J. Cramer. Steckert-Hafner Inc. New York.
A taxonomic description of the cunner, *(Labrus adspersus)*, is provided (p. 254-255).

Warfel, H. E. and D. Merriman.
1944. Studies on the marine resources of southern New England. I. An analysis of the fish populations of the shore zone. Bull. Bingham Oceanogr. Coll., 9(2): 1-91.
The cunner is listed as one of the species obtained from the Morris Cove area. "*Tautogolabrus adspersus* and *Opsanus tau* were apparently wanderers from rocky habitats where they are well known, although they have been reported from sand or muddy bottoms occasionally." p. 60.

Weis, J. S.
1968. The occurrence of nerve growth factor in teleost fishes. Experientia, 24(7): 736-737.
The results of bioassays on the cunner spinal axes are listed.

Wheatland, S. B.
1952-1954. VII. Pelagic fish eggs and larvae. Bull. Bingham Oceanogr. Coll., 15:234-314. Bull. Bingham Oceanogr. Coll., 15: 234-314.
The relative abundance of eggs and larvae obtained from L.I.S. is listed. Data pertinent to other characteristics of cunner eggs and larvae (size, number collected, etc.) is provided in tables. An excellent discussion of cunner eggs and larval distribution and abundance is given with explanations accounting for the decrease in cunner egg diameter observed through the spawning season.

Whiteaves, J. F.
1886. Catalogue of Canadian Pinnipedia, Cetacea, fishes and marine invertebrates. Ottawa, Canada, 42 pp.
Specimens of cunner from Canadian waters were exhibited at the Colonial and Indian Exhibition in London (p. 16).

Wicklund, R. I.
1970. Observations on the spawning of the cunner in waters of northern New Jersey. Chesapeake Sci., 11(2): 137.
The spawning behavior of the cunner was observed in their natural habitat at Shrewsbury Rocks, New Jersey. "Cunner spawning was observed. . .after 1200 hr and before 1700 hr of June and July,

1963. . . Prespawning behavior took place within small aggregations of 3 to 15 cunners which became more active than usual, milling and darting about. Chasing next ensued, one fish, pursued by several others, moving in small circular paths in and out of rock crevices and over rises on the bottom. The spawning act took from two to three seconds. In each instance, a group of fish made a quick turn upward to converge at a point one to two meters above the bottom, where the fish either contacted or merely touched each other. Then they immediately swam down and glided in a curving path toward the bottom away from a white cloud, presumably milt and eggs which they had discharged at the apex of the upward spawning movement. . ."

Wilbur, C. G.
1956. The physiology of the heart of marine fish. Biol. Bull. (Woods Hole), 111(2): 316. (abstract).
At a given temperature larger fish have slower heart beats than smaller fish. "A few average values in beats per minute for fish arranged in order of decreasing size: *Roccus*, 20; *Oppsanus*, 40; *Prionotus*, 50; *Tautogolabrus*, 60; *Fundulus*, 100."

Williams, G. C.
1906. Dispersal of young marine fishes near Woods Hole, Massachusetts. Publ. Mus. Mich. State Univ., Biol. Ser., 1(10): 331-367.
The cunner is listed (p. 343) as a species often taken by anglers near Waquoit Bay.

Williams, G. C.
1967. Identification and seasonal size changes of eggs of the labrid fishes, *Tautogolabrus adspersus* and *Tautoga onitis*, of Long Island Sound. Copeia, 1967(2): 452-453.
Observation indicated that the eggs of cunner and tautog could be correctly identified from each other by the use of monthly egg-diameter frequency distributions.

Williams, G. C.
1968. Bathymetric distribution of planktonic fish eggs in Long Island Sound. Limnol. Oceanogr., 13(2): 382-385.
The distribution of cunner eggs was strongly vertically stratified with most of the eggs obtained from the upper five meters of water.

Williamson, W. D.
1832. Chapter on Fishes, p. 150-164. *In* W. D. Williamson [ed.], The history of the state of Maine, from its first discovery, A.D. 1602, to the Separation, A.D. 1820, vol. 1. Glazier, Masters Co., Hallowell, Maine.
"'Cunner' is a brown coloured, scaled salt water fish, as large as a white perch, and is a good pan-fish. It has a horny or thorned back, and is found in Casco bay and westward; and weighs from 1 to 6 pounds."

Yudkin, W. H.
1945. Occurrence of thiaminase in marine teleosts. Proc. Soc. Exp. Med., 60: 268-269.
Assays for the presence of thiaminase were conducted on the cunner and three other marine species. No thiaminase was present in any of the fish tested.

Zube, E. H. and C. A. Carlozzi, eds.
1967. An inventory and interpretation. Selected resources of the Island of Nantucket. Coop. Exten. Serv., Univ. Mass., Publ. No. 4. 135 pp.
The tautog *(Tautoga onitis)* and cunner *(Tautogolabrus adspersus)* were commonly caught while sampling in Nantucket and Madaket Harbors. Their diet consist of shrimp, amphipods, mussels, crabs, etc. (p. 55-58).

ADDENDUM

Most of the entries below were listed in Fish of the Gulf of St. Lawrence, An Unabridged Bibliography, (Technical Report Number 261, Fisheries Research Board of Canada) by V. M. Srivastava. The publications referred to have not been seen by the authors and are not included in the index. Although not annotated, they are presented in the interest of completeness and to inform the reader that additional information, albeit obscure, is available.

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1956. Liste préliminarie des représentants de la région des Iles-de-la-Madeleine, P. Q. Dept. Pech., Sta. Biol. Mar. Grande-Rivière, Manuscript.

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1960a. Liste des poissons marins de l'estuaire du Golfe Saint-Laurent. Contr. Dep. Peche. Que. 80: 1-27.

Bergeron, J.
1960b. Liste des poisons capturés dans la région de la Baie-des-Chaleurs et du Golfe Saint-Laurent par la station de biologie marine de Grande Rivière de 1952 a 1960. Dept. Pech., Sta. Biol. Mar. Grande Rivière. (MS).

Bergeron, J. and G. LaCroix.
1963. Catches of fish larvae from the southwestern Gulf of St. Lawrence in 1962. Rapp. Ann. (1963) Sta. Biol. Mar., Grande Rivière: 69-76.

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1970. Catalogue des espéces de poissons déposés au musée de la station de biologie marine de Grande-Rivière (Gaspé-Sud) 1932-1969. Quebec, Min. Indust. Commerce, Service Biol., Cahiers D-information 51:1-86. D-information 51: 1—86.

Fortin, P.
1863. List of the cetacea, fishes, crustacea and mollusca, which now inhabit and have inhabited the Canadian shores of the Gulf of St. Lawrence and are objects of fishing operations, whether on a large or small scale, and which are used as bait, etc... Ann. Rept. of Pierre Fortin, for 1861-1862, Quebec 109-124.

Gauthier, M.
1966. Poissons rares ... peu abondants ... non commerciaux. Le point sur les connaissances en biologie des peches dans le Golft Sant Laurent. G.T.B.P. Doc 33: 1-9 (MS).

Halkett, A.
1914. Natural history report. Dept. Mar. Fish., Ann. Rep. for 1913-1914, A.F.P. 14: 343-367.

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1964. Plankton collections from the western Gulf of St. Lawrence and central Nova Scotia banks, 1958-1962. Fish. Res. Bd. Canada, MS Report (Biol.), No. 799, 69 pp.

LaCroix, G.
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LaCroix, G. and J. Bergeron.
1964. Prélévements de larves de poissons dans le sud-ouest du Golfe Saint Laurent en 1963. Rapp. Ann. 1963, Sta. Biol. Mar. Grande-Rivière: 25-37.

Lacroix, G. and L. Legendre.
1964. Le zooplankton et al[èstuaire de le Rivière Restigouché (Baie des Chaleurs): Quantitiés et composition en août 1962. Nat. Can. 91(1): 21-40.

Scarrat, D. J. and A. J. Wilson.
1970. Experiments with rotenone in Northumberland Strait and stomach analysis of fish collected. Fish. Res. Bd. Canada, MS Rep. 1107: 1-7.

Van Vliet, W. H.
1970. Shore and freshwater fish collections from Newfoundland. Nat. Mus. Canada, Publ. Zool. 3: 1-30.

Van Vliet, W. H. and D. E. McAllister.
1961. Preliminary list of marine fishes of Quebec. Nat. Can., 88(3): 53-78.

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