

**Spawning of the Cobia, *Rachycentron canadum*, in the Chesapeake Bay Area,  
with Observations of Juvenile Specimens**

E. Joseph, J. J. Norcross, and W.H. Massmann  
1964

SEDAR58-RD24

10 April 2018



# Spawning of the Cobia, *Rachycentron canadum*, in the Chesapeake Bay Area, with Observations of Juvenile Specimens<sup>1</sup>

EDWIN B. JOSEPH, JOHN J. NORCROSS AND WILLIAM H. MASSMANN<sup>2</sup>

## ABSTRACT

Pelagic eggs collected in Atlantic coastal waters adjacent to Chesapeake Bay have been identified as those of the cobia, *Rachycentron canadum* (Linnaeus). The egg diameters ranged from 1.16 mm to 1.42 mm with a mean of 1.27 mm. The single large oil globule had a mean diameter of 0.38 mm.

The presence of gravid females and the appearance of cobia eggs in plankton collections indicated that spawning occurs between mid June and mid August. Sampling in 1960 showed spawning maxima to be in June and July.

Although virtually all of the cobia eggs were collected in the Atlantic, knowledge of the current patterns in the survey area led to the conclusion that spawning occurred in lower Chesapeake Bay or in the immediate vicinity of the Virginia Capes.

The color pattern and fin shape is described and illustrated from two juvenile cobia collected in August 1962. Observations made before capture of the juveniles point out that certain adult behavioral characteristics are already well established in the first few months of juvenile existence.

## Introduction

The biology of the cobia, *Rachycentron canadum* (Linnaeus) is little known. Especially neglected have been studies of early life history; our knowledge of this phase has not advanced since Ryder (1887) succeeded in fertilizing eggs and rearing the embryos through hatching. The number of embryos hatched and the length of time they were maintained is not recorded. Ryder's observations were based on work conducted on the east shore of Chesapeake Bay near Cherry Stone, Virginia. Several authors, including Smith (1907) and Hildebrand and Schroeder (1928) have cited Ryder's work, yet, since that time neither eggs nor larvae have been reported from field collections and descriptions of juveniles are few and inadequate.

In the present paper, the seasonal and spatial distribution of pelagic eggs collected in Atlantic waters adjacent to lower Ches-

apeake Bay and identified as cobia are summarized. Early larval stages have yet to be found or at least have not been recognized as such; however, additional observations on the color pattern and the behavior of juveniles are included.

## Methods

The eggs reported here were obtained on plankton cruises made during the summers of 1960 and 1961 as part of a large-scale study of spawning activities in lower Chesapeake Bay and contiguous waters of the Atlantic Ocean. The original stations, collecting methods and objectives were described by Joseph et al. (1960). Later modifications in sampling gear and station pattern were summarized by Massmann et al. (1962). For the most part the eggs were obtained with meter and half-meter nets on the station pattern shown in Fig. 1. The station pattern encompassed an area approximately 40 by 60 nautical miles. The numerical designation of the transects was obtained by dropping the first digit of the latitude. Thus, transect 700 lies at 37°00' N. latitude and transect 710 at 37°10' N. The

<sup>1</sup> Contribution No. 157 of the Virginia Institute of Marine Science, Gloucester Point, Virginia.

<sup>2</sup> Present address, Sport Fishing Institute, Bond Building, Washington 5, D.C.

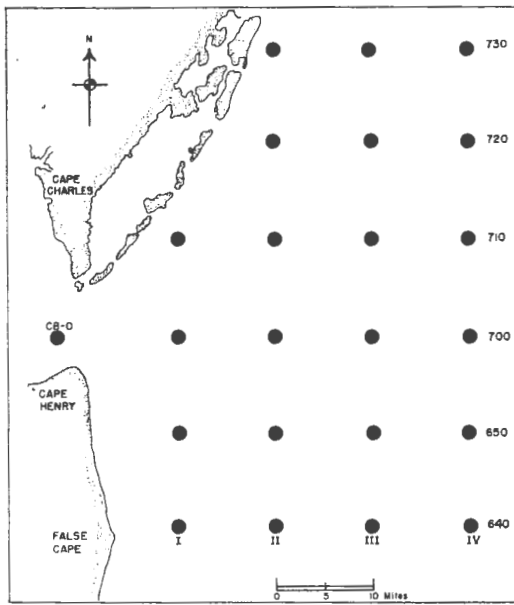


Fig. 1.—Stations offshore from Chesapeake Bay that were occupied during plankton cruises from December 1959 to December 1960. East-west transects are designated by numbers 640 to 730 and north-south columns by Roman numerals I to IV. Station at Bay mouth is CB-O.

distance between stations is ten nautical miles.

The two juveniles on which the color pattern and behavioral observations were based were caught in the York River from the laboratory pier of the Virginia Institute of Marine Science.

## Results and Discussion

### IDENTIFICATION OF THE COBIA EGG

Our identification of the eggs was based in part on Ryder's (1887) description and in part on comparison with nearly ripe ova stripped from mature cobia.

Ryder gave the diameter of fertilized eggs as 1.25 mm. One can only assume that this was a mean diameter, yet no indication of variability was cited. He described the oil globule as being large and refringent but included no dimension. Several features mentioned by Ryder, including fragmentation of the yolk into irregular masses and the separation of these masses by thin processes of cortical protoplasm, were not

observed in eggs from our plankton tows. Ryder may well have based his description on living material, of which certain features are lost after preservation. He further characterized the cobia embryo as being unusual in that the segmentation of the embryonic axis continued posteriorly onto the blastodermic rim surrounding the blastopore. None of the embryos in our collections was in the precise stage of development which would permit comparison in this respect.

Considerable variation in total diameter of the egg was noted both within and between samples. The size range of 52 eggs from the June 1960 collections was 1.27 to 1.42 mm with a mean diameter of 1.34 mm. Another sample of 50 eggs from July 1960 ranged from 1.16 to 1.31 mm with a mean diameter of 1.21 mm. Thus, the mean values of the two samples lie to either side of the figure reported by Ryder.

The large oil globule (0.34–0.44,  $\bar{X}$  = 0.38 mm) is one of the most distinctive features of the cobia egg. Only one other kind of pelagic egg seen thus far in Virginia waters has a globule of similar size. This is a much larger egg having a mean size of 1.7 mm and is thought to be that of the cutlass fish (*Trichiurus lepturus*).

### SEASON OF SPAWNING

Judging by the presence of cobia eggs in plankton tows made each month during 1960, June and July are the principal months of spawning. There is some carry-over into August, as a few eggs were found in that month in 1960 and 1961. Many mature cobia have been examined for reproductive condition from the time of their first appearance in May until late September. Gravid females have been observed from mid-June through mid-August only, thus, agreement with presence of eggs in plankton collections is excellent.

### LOCATION OF SPAWNING

Only in 1960, when 228 cobia eggs were collected, could any suggestion of distribution of spawning activities be gained. Of that number, 225 were collected in Atlantic waters, with the remaining three found just inside the mouth of the bay. During 1961

and 1962 too few cobia eggs were obtained to elaborate on the previously established pattern.

Several stations in lower Chesapeake Bay in addition to the one shown in Fig. 1 (CB-0) were sampled, but no cobia eggs were obtained. We believe lower Chesapeake Bay may be an important spawning area despite our failure to obtain more than a few eggs. Plankton sampling in the lower bay during the summer months was severely hampered by the presence of large numbers of ctenophores and various medusae. When nets became clogged rapidly and when samples contained large volumes of partially disintegrated gelatinous material, the reliability of the samples to indicate presence of eggs was questionable.

Two principal features of distribution are contained in Table 1. First is the absence of eggs on the outermost column of stations, limiting them to waters mostly inside the ten fathom contour. A second point is the complete absence of eggs on all transects north of the mouth of Chesapeake Bay.

If the presence of eggs was taken as evidence of *in situ* deposition then one would be hard pressed to explain why the lower half of the survey area provided suitable spawning grounds while the generally similar environment of the upper half did not. In the present case it is believed

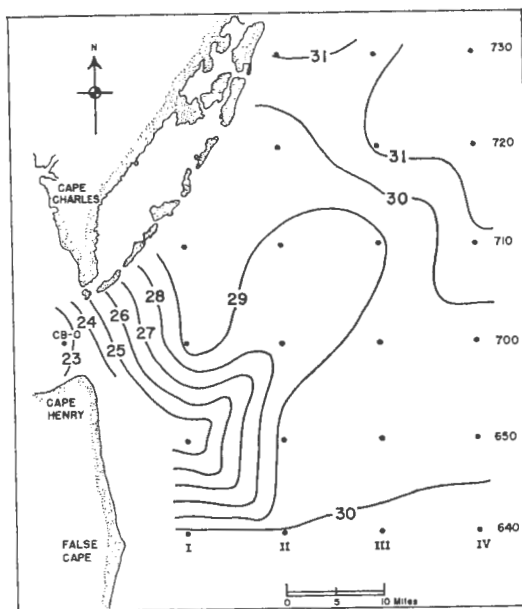


Fig. 2.—Surface isohalines in survey area during June 1960 cruise.

that the site of deposition was not as suggested by the presence of eggs, but rather was in the lower bay or in the immediate vicinity of the Virginia Capes. The basis for this interpretation is the surface salinity pattern shown in Fig. 2. During the June survey relatively low-salinity effluent from Chesapeake Bay was spreading well offshore to the southeast and composed most of the waters in which cobia eggs were found. Since the eggs were collected in the uppermost meter of water they would have been subject to this transport. An inshore origin of the eggs would explain their absence on the northern three transects, as bay effluents are generally deflected toward the south. The surface salinity pattern in July differed in detail from that shown in Fig. 2, but would provide the same interpretation.

TABLE 1.—Numbers of eggs of cobia, *Rachycentron canadum*, collected June–August 1960

Date	Stations along north-south columns					Total	
	CB-0	I	II	III	IV		
June	0	17	35	13	0	65	
July	0	9	146	1	0	156	
August	3	3	0	1	0	7	
<b>Total</b>	<b>3</b>	<b>29</b>	<b>181</b>	<b>15</b>	<b>0</b>	<b>228</b>	
Date	Stations along east-west transects						Total
	640	650	700	710	720	730	
June	17	46	2	0	0	0	65
July	0	48	108	0	0	0	156
August	3	1	0	0	0	0	4
<b>Total</b>	<b>20</b>	<b>95</b>	<b>110</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>225</b>

OBSERVATIONS ON JUVENILES

On 15 August 1962, two juvenile cobia, 108 and 120 mm T.L. were caught near the mouth of the York River, Virginia, from the laboratory pier of the Virginia Institute of Marine Science. These are not the smallest taken in the Chesapeake Bay area; an 86 mm specimen was collected in the York

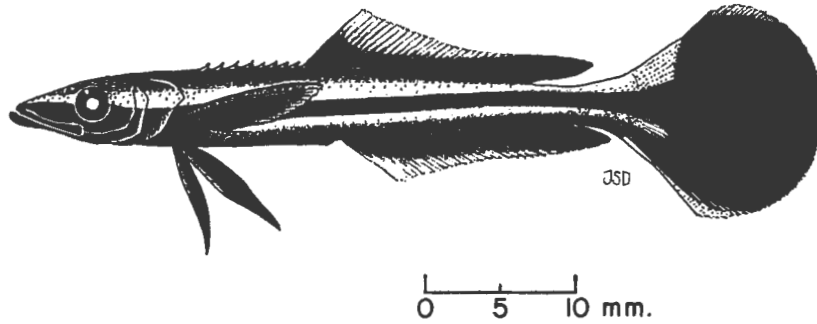


FIG. 3.—Composite drawing of juvenile cobia, *Rachycentron canadum*, (180 mm T.L.).

River in August of 1951, and on 12 July 1960 a 58 mm juvenile was collected from the Eastern Shore of Virginia at Wachapreague. Since the season of spawning has been established as June through August, none of the juveniles mentioned were more than two months old. Certain juvenile characteristics as well as aspects of behavior of the two larger individuals seem worthy of note.

The two juveniles obtained in August, 1962 were maintained in a 20-gallon Plexiglass aquarium. As soon as the fish had adjusted to the tank we attempted to photograph them. Unfortunately, none of the photographs showed all of the fins in an expanded state. A composite illustration (Fig. 3) was prepared to show fin shape and coloration.

Hildebrand and Schroeder (1928:235) described the young cobia as differing, "from the adult in the more elongate body, less strongly depressed head, in having the caudal fin truncate instead of forked, and in being somewhat lighter in color and having a black lateral band, which extends from the snout, through the eye, to the base of the caudal". They did not record the length of the specimen described but it must have represented a more advanced stage than is described here.

The color pattern of the two juveniles differed not only from the adult pattern but also from the description of the young previously cited. The prominent black longitudinal band extended the full length of the body and was bounded above and below by white stripes which set off the black band in sharp contrast. The upper or dorso-lateral white band extended anteriorly onto the

head, passing just above the eye and becoming diffuse on the snout. Posteriorly the dorso-lateral band from each side became confluent over the top of the caudal peduncle and extended onto the caudal fin approximately one-third the distance from the hypural plate to the extremity of the fin. The ventro-lateral white band ended anteriorly at the level of the pectoral base. Posteriorly, the ventro-lateral bands from each side did not converge in the region of the peduncle but ended separately on the caudal fin just posterior to the hypural plate. The dorsal and ventral edges of the caudal fin had narrow white margins.

The entire margin of the soft dorsal was white. Anteriorly the white portion included the dorsal one-third of the elevated portion of the fin, but became progressively narrower posteriorly. The anal fin was marked similarly except that the white margin was limited to the anterior half. Except for a very narrow and inconspicuous margin on the pectorals, the paired fins were black. The strongly contrasting color pattern was not due to the influence of the bright lamp used in photographing the fish, as this pattern was equally obvious when the fish were first observed in the river. After preservation in 10% formalin, the white areas became dusky; however, the pattern was still apparent. Fowler (1945) illustrated an 85 mm specimen which, judging from the lack of contrast, was probably preserved and faded before being illustrated.

The caudal fin of the adult cobia is generally described as forked but is more properly described as lunate. Hildebrand and Schroeder (1928) described the caudal fin of

the young as truncate. In the two juveniles described here, the caudal fin was much expanded and broadly rounded. In Fowler's illustration the caudal fin is not fully expanded, therefore the shape is not discernible.

The tendency of adult cobia to lie in the shadow of a boat, buoy or other floating object is well known. When the two juveniles were first observed they were swimming under an anchored skiff. They were observed to dart out from under the boat and seize juvenile silversides, *Membras martinica*, which were mostly 25 to 40 mm in length, and immediately return to the cover provided by the skiff. This sequence was observed several times before attempts were made to catch the specimens. Even after several attempts on our part to capture the two cobia with a dip net, they showed no tendency to leave the protection provided by the skiff. It is noteworthy that these adult habits are so strongly fixed at such an early stage of development.

We were successful in maintaining the cobia for several weeks in the 20-gallon aquarium. After less than 24 hours, accommodation to the tank seemed quite com-

plete. From the second day on, they fed actively on bits of fresh fish dropped into the tank. They would dart up to the pieces of fish, seize and swallow them with no inspection; however, once a piece of fish came to rest on the bottom of the tank, the cobia showed little or no interest in it.

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*Virginia Institute of Marine Science  
Gloucester Point, Virginia.*