NOTES

OBSERVATIONS ON TWO SPECIES OF DOLPHIN (*Coryphaena*) FROM THE TROPICAL MID-ATLANTIC

Large numbers of adult dolphin, *Coryphaena hippurus* Linnaeus, aggregated at night around the U.S. Coast and Geodetic Survey Ship *Discoverer* as it drifted in the tropical mid-Atlantic Ocean in February 1969 (see Stoner, 1969). Only juveniles of *Coryphaena equiselis* Linnaeus, however, were caught under the night light. This note presents additional details of coloration and meristic counts of juvenile *C. equiselis* and reports on mid-oceanic concentrations of adult *C. hippurus*.

The drift track of the RV *Discoverer* on the Atlantic Trade Wind Expedition (ATEX)—lat 13°48′ N long 39°03′ W to lat 09°55′ N long 44° 35′ W, February 5 to 22, 1969—is shown in Figure 1 (see also Potthoff, 1969). The surface temperature of the water during the drift period ranged from 25.3° C to 26.8° C and the water depth from 1,757 fm to 2,753 fm.

Gibbs and Collette (1959) reported that very small juvenile *C. hippurus* resembled miniature feathers with dark and light bars alternating along their bodies and dorsal and anal fins. Very small *C. equiselis*, in contrast, tended to be uniformly dark along their sides, sometimes displaying weak bars along their fins. During the drift, 78 juvenile dolphin were caught by dip net; all were identified as *C. equiselis* on the basis of pigmentation on the caudal and pelvic fins (Gibbs and Collette, 1959) and vertebral counts (Collette et al., 1969). In the present sample, specimens ranging from 25 mm SL to 90 mm SL all had dark vertical bars on their bodies; the bars were most pronounced over the anal fin on the ventral half of the fish (Figure 2). The smallest *C. equiselis* juveniles (less than 25 mm SL) tended to be darker, with less pronounced

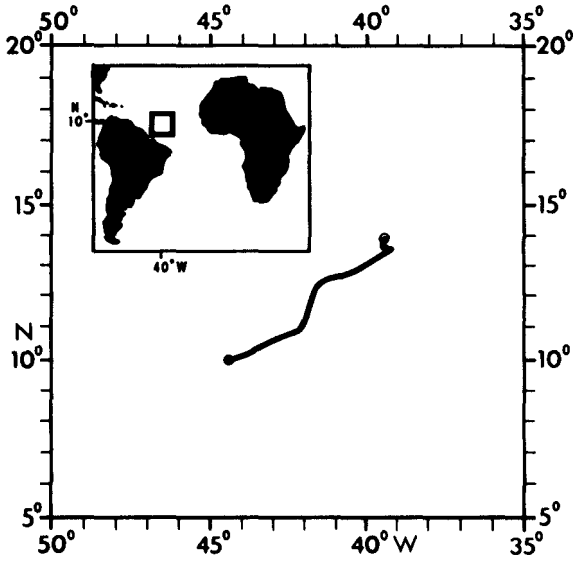

FIGURE 1.—Drift track of the RV *Discoverer* during the Atlantic Trade Wind Expedition (ATEX). The square on the insert map represents the area covered by the map.

FIGURE 2.—*Coryphaena equiselis*, 40 mm SL from the tropical mid-Atlantic Ocean, caught aboard the RV *Discoverer*, 19 February 1969.

bars or no bars on the body, and specimens larger than 90 mm SL had no bars on their bodies. A single specimen of 230 mm SL exhibited no juvenile coloration. The caudal fork margin was dark, as were the pelvic fins; however, the vertebral count (14 + 19 = 33) was that of *C. equiselis* not *C. hippurus* (Collette et al., 1969). Sixty-three of the juvenile specimens were cleared and stained to obtain vertebral counts (Table 1), leading to their positive identification as *C. equiselis*. In counting

[1] Contribution No. 194, National Marine Fisheries Service, Tropical Atlantic Biological Laboratory, Miami, Fla. 33149.

vertebrae, any vertebra associated with a pair of pleural ribs was counted as precaudal, any vertebra lacking pleural ribs was counted as caudal.

In the cleared and stained juveniles, the modal group of dorsal-fin elements was 55 to 57 (Table 1), which is more similar to the modal group of 56 to 60 for Atlantic *C. hippurus* (Gibbs and Collette, 1959) and of Pacific *C. hippurus* (Rothschild, 1964), than to that of *C. equiselis* (51-55) which these authors reported. The higher mode in these specimens of *C. equiselis* from the tropical mid-Atlantic may be representative of an oceanic population, different from that sampled by Gibbs and Collette (1959) who may have included specimens from more than one population. On the other hand, I may have counted elements in the cleared and stained specimens that were not visible to Gibbs and Collette (1959) in their untreated specimens.

Counts of the anal-fin elements of the specimens from the tropical mid-Atlantic (Table 1) were not appreciably different from those reported by Gibbs and Collette (1959). However, the mode was one fin ray higher than those from the Pacific reported by Rothschild (1964). Total gill raker counts (Table 1) of my specimens were not appreciably different from those reported by Gibbs and Collette (1959) for young *C. equiselis*, but differed from Rothschild's (1964) total counts on adult specimens by two or three rakers. My gill raker counts were made on cleared and stained juvenile specimens and did not include tooth patches on the epibranchial and hypobranchial bones; the gill raker in the epi-ceratobranchial angle was included in the ceratobranchial count. Total counts tended to decrease as fish size increased, which led me to believe that the rakers over the epibranchial and hypobranchial bones are gradually transformed into tooth patches. In specimens below 30 mm SL, the gill rakers over the epibranchial and hypobranchial bones were very small with many minute teeth. In intermediate-sized specimens (40-60 mm SL) some tooth patches could be counted over the two bones along with gill rakers. The epibranchial and hypobranchial bones of juveniles above 80 mm SL were all covered with fine teeth; the hypobranchial bone had no gill rakers associated with it, whereas the epibranchial usually had one gill raker.

Size distribution of juvenile *C. equiselis* caught during the drift period is shown in Figure 3. The mode is from 40 to 44 mm SL. From size

TABLE 1.—Frequency distribution of some meristic characters of juvenile *Coryphaena equiselis* from the tropical mid-Atlantic and data on juvenile and adult *C. equiselis* from Gibbs and Collette (1959) and Collette et al. (1969).

	Fins																										
	Dorsal fin rays																	Anal fin rays									
	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	N	$\bar{x}$	23	24	25	26	27	28	29	N	$\bar{x}$
Tropical mid-Atlantic	--	--	--	--	--	--	2	1	9	15	13	15	6	2	--	63	55.8	--	1	6	23	21	12	--	63	26.6
Gibbs and Collette (1959)	1	--	4	10	15	26	31	40	35	22	9	1	--	--	1	195	52.6	5	24	62	86	38	6	1	222	25.7

	Vertebrae						
	Precaudal		Caudal			Total	
	13	14	19	20	21	33	34
Tropical mid-Atlantic	55	8	8	55	--	63	--
Collette et al. (1969)	67	12	12	66	1	78	1

	Gill rakers											
	Epibranchial		Ceratobranchial			Hypobranchial			Total			
Tropical mid-Atlantic SL (*mm*)	1	2	9	10	11	0	1	2	11	12	13	14
<30	3	12	1	12	2	--	11	4	--	3	7	5
30-50	13	19	1	28	3	5	23	4	2	13	13	4
51-80	8	4	1	11	--	6	6	--	5	4	3	--
>80	3	--	--	1	2	2	1	--	--	3	--	--

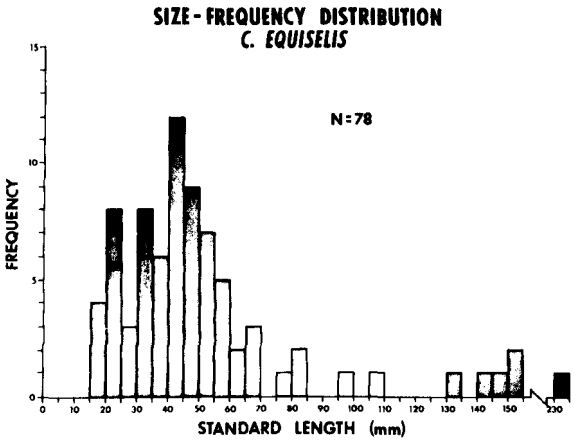

FIGURE 3.—Size-frequency distribution of *Coryphaena equiselis* which were attracted to the night light and caught in dip net during ATEX aboard the RV *Discoverer*, February 1969.

data, I infer that the species spawns in the tropical mid-Atlantic during January and February.

My specimens are presently stored at the Tropical Atlantic Biological Laboratory, Miami, Fla.

I thank Drs. Bruce B. Collette, Robert H. Gibbs, Jr., and Robert V. Miller for reviewing the manuscript, and Grady W. Reinert for preparing the illustrations.

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RESPIRATORY, BEHAVIORIAL, AND ENDOCRINE RESPONSES OF A TELEOST TO A RESTRICTED ENVIRONMENT

It is common practice when measuring fish respiration or activity to allow a varying length of time for the fish to become accustomed to the restrictions imposed by the apparatus and to allow time for any oxygen debt to be repaid (Fry, 1957). The following observations indicate that such a procedure may introduce complications in the interpretation of results since the acclimation process results in changes in respiration, behavior, and endocrine activity.

Poecilia reticulata males were placed in groups of 10 in the 100-ml chamber of a continuous flow respirometer. Animals were maintained at 25° C with a 12-hr daylength and fed daily at the start of the light period. Measurements of oxygen were made with the wide bore dropping mercury electrode (Briggs, Dyke, and Knowles, 1958) or by the micro Winkler method (Fox and Wingfield, 1938).

A daily cycle of routine respiratory activity in such an apparatus has already been described (Sage, 1968). The minimum of oxygen consumption occurs at the end of the dark period 23 hr after the last feed and this rate approximates to the standard metabolic rate. Measurement of this rate at daily intervals indicates a progressive fall in standard oxygen consumption (Table 1). A similar fall in respiratory rate

TABLE 1.—Effect of number of days in respirometer on standard rate of oxygen consumption of a group of 10 fish.

Days	Oxygen uptake $mm^3/g/hr$
1	212
2	156
3	126
4	109

to a base line of approximately 100 $mm^3/g/hr$ was observed with four other groups of fish whereas control animals from large containers