

haden in the South Atlantic summer fishery alone was 34,435 metric tons.

Estimates of the thread herring population size expressed in metric tons equal approximately 45,000 \pm 23,000 in 1968 and 71,000 \pm 21,000 in 1969. The 95% confidence intervals suggest that true population size might vary from 22,000 to 92,000 metric tons. Thus, the thread herring resource appears capable of supporting a larger fishery at this time since not more than 10% of the population was harvested in 1968 or 1969, but it does not appear to have the capacity to offer an alternate resource for the Atlantic menhaden fishery. Thread herring distribution is generally limited to the South Atlantic area, whereas Atlantic menhaden are distributed along most of the Atlantic coast of the United States. A 50% harvest rate, at most, would amount to little more than the present menhaden landings in the South Atlantic summer fishery.

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MERISTIC CHARACTERS OF SOME MARINE FISHES OF THE WESTERN ATLANTIC OCEAN¹

This report presents data on meristic characters from radiographs of 642 species of marine fishes representing 113 families, collected from Cape Hatteras, N.C., to northern Brazil, including the Gulf of Mexico and the Caribbean Sea. Most of the specimens were collected on cruises of the National Marine Fisheries Service. The chartered vessel *Silver Bay* and the NMFS research vessel *Oregon* made these cruises from the Exploratory Fishing and Gear Research Base, Pascagoula, Miss., and the Exploratory Fishing and Gear Research Station, St. Simons Island, Ga. Additional material was obtained from shrimp trawling and beach seining in coastal Georgia. Papers by Hollister (1936, 1937a, b, 1940, 1941), Clothier (1950), Hubbs and Lagler (1958), and Lagler, Bardach, and Miller (1962) were helpful in determining vertebral and other skeletal characters. The phylogenetic arrangement and spelling of families, genera, and species were made, when applicable, in accordance with the American Fisheries Society's *List of Common and Scientific Names of Fishes* (Bailey, 1970).

Methods and Procedures

We x-rayed at least four specimens of most species; for some species fewer than four were available. Specimens ranged from 12 to 580 mm standard length (SL). Specimens smaller than about 60 mm SL were x-rayed with a soft-ray machine and larger specimens with a hard-ray machine.

Counts of precaudal and caudal vertebrae, dorsal and anal spines, and soft rays, and primary and secondary caudal rays were made with the aid of a dissecting microscope or an x-ray illuminator. These meristic counts for all species were made independently by each of us;

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we exchanged radiographs and checked each other's work; then at a later date and following the same procedures, we reread the radiographs.

The counts (Table 1) very likely do not represent the complete range for any species because too few specimens have been examined. Counts from specimens with obvious deformities or any recognizable abnormality or aberration are not included. When more than one separate dorsal or anal fin is present, and composed of soft rays only (e.g., Gadidae and Moridae), the count for the anterior fin is followed by a comma and the count for the posterior fin. Dashes are used to separate counts, or to replace counts to indicate that we were unable to make an accurate count from the radiograph.

In the dorsal fin in *Macrozoarces americanus* (Zoarcidae), two groups of soft rays are separated by spines. Finlets in Carangidae, Gempylidae, Scomberesocidae, and Scombridae are separated from fin-ray counts by a plus (+) sign. A plus sign is also used to show a divided anal fin in Sternoptichidae.

Cyclopterus lumpus and *Enchelyopus cimbrius* normally occur north of the study area, but their meristics were available and are included in this paper for comparative purposes. Some species which are anadromous have been included, e.g., *Alosa sapidissima*, even though the adults have been taken only in fresh or brackish waters. Other species, e.g., *Agonostomus monticola*, are reported in the literature as occurring in fresh water only but are included here because at times they have been found in the ocean (Anderson, 1957).

Definitions

In the following definitions we have tried to provide a general scheme for distinguishing the meristic characters of 642 different species although all specimens of all 642 species do not agree with our guidelines.

Total vertebrae: All vertebrae, includes the anterior-most centrum, and the urostyle which we count as the terminal centrum.

Precaudal vertebrae: Vertebrae with no hemal arches or hemal spines.

Caudal vertebrae: Vertebrae with hemal spines; typically the first hemal spine is associated with one or more anterior proximal radial elements of the anal fin. Our definition of precaudal and caudal vertebrae will not work for all species because in certain groups, e.g., Clupeidae, transitional centra may be present. If transitional centra are known to occur, the total number of vertebrae is a more meaningful character than a precaudal and caudal vertebral separation.

Spines: All true spines are median unpaired structures, without segmentation; they are usually stout and rigid with sharp tips and are never branched. *Rays* (Soft rays): Are usually, though not always, branched and flexible, and are paired and segmented. Dorsal and anal fin-ray counts include all rays observed. If the terminal ray is bifid and articulated with a single pterygiophore, it is counted as one ray. Dorsal or anal fin spines are tabulated as a group; a spine in the second fin (if a spine is present) is counted with the spines of the anterior fin.

We distinguished caudal primary (principal) soft rays as those which articulate with the hypural bones. Typically the primary rays include all of the branched rays plus one dorsal and one ventral unbranched ray. In some species the primary caudal rays may all be branched. Some species have primary rays only. Primary rays often overlap onto the epural bones or hemal spine of the penultimate vertebra, and our personal judgment, based upon our interpretation of the literature, was used to determine if the ray was primary or secondary (procurrent). In a few species no distinction between primary and secondary rays could be made from the radiograph, and the total number of caudal soft-rays is listed.

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TABLE 1.—Meristic characters of some marine fishes of the western North Atlantic Ocean.—Continued.

FAMILY	Size range SL	Specimens examined	VERTEBRAE			DORSAL FIN		ANAL FIN		CAUDAL FIN							
			Total	Precaudal	Caudal	Spines	Rays	Spines	Rays	Total	Dorsal secondary rays	Dorsal primary rays	Ventral primary rays	Ventral secondary rays			
Genus, species	mm	No.	Number														
CHAUNACIDAE																	
<i>Chaunax pictus</i>	61-123	4	19-20	12	7-8	1	11-12	0	7	9	0	4	5	0			
CHEILODIPTERIDAE																	
<i>Apogon aurolineatus</i>	40	1	24	10	14	7	9	2	8	29	6	9	8	6			
<i>Apogon binotatus</i>	30-60	3	24	10	15	8	8-9	2	7-8	31-32	7-8	9	8	5-7			
<i>Cheilodipterus affinis</i>	39-54	3	24	10	15	7	9	2	7-9	32-34	7	9	8	5-7			
<i>Epigonus occidentalis</i>	103-136	4	25	10	15	8	10	2	9	36-39	10-12	9	8	10-11			
<i>Epigonus pandionis</i>	99-112	4	25	10	15	8	9-10	2	9	35-37	9-11	9	8	7-10			
<i>Phaeoptyx conklini</i>	34-46	3	24	10	14	8	9	1-2	8	27-31	5-7	9	8	5-7			
<i>Phaeoptyx pigmentaria</i>	44	1	24	10	14	7	9	2	8	30	7	9	8	6			
<i>Phaeoptyx tridactylus</i>	78-87	4	24	10	14	8	9	2	8	30-32	7-8	9	8	6-7			
<i>Phaeoptyx quadriguttatus</i>	42	1	24	10	14	8	9	2	8	31	7	9	8	7			
<i>Syngnathus bella</i>	118-160	4	25	10	15	10	9	2	7	35-36	10	9	8	8-9			
<i>Syngnathus pseudoheterolepis</i>	83-89	4	25	10	15	10	10	2	7	41-42	12-13	9	8	12-13			
<i>Syngnathus spinosus</i>	80-115	4	25	10	15	10	8-9	2	7	35	9	9	8	9			
CHOROPHTHALMIDAE																	
<i>Chlorophthalmus exsini</i>	107-127	7	16-18	18	28-30	0	10-12	0	8	43-46	13-14	10	9	11-13			
<i>Farsandus tricoloratus</i>	135-140	4	39	17	22	0	10	0	8-9	40-42	11-13	10	9	11-13			
CLINIIDAE																	
<i>Labrisomus suppi</i>	30-57	3	35	11	24	19	10-11	2	18-19	29	8	7	6	8			
<i>Labrisomus cuculliferus</i>	90-110	4	34	11	23	18	12	2	18-19	28-30	8-9	7	6	7-8			
<i>Starkia y-lineata</i>	12-14	2	31	10	21	19	7	2	14-15	-	-	-	-	-			
CLUPPIDAE																	
<i>Alopias aestivialis</i>	137-215	6	47-51	14-16	33-35	0	17-18	0	16-20	32-34	7-8	10	9	6-7			
<i>Alopias mediodorsalis</i>	118	1	54	17	37	0	19	0	22	35	9	10	9	7			
<i>Alopias apidiasinus</i>	103-121	5	56-57	18-19	37-38	0	16-19	0	19-21	33-34	7-8	10	9	7			
<i>Brevoortia pumilus</i>	190	1	44	14	30	0	20	0	21	36	9	10	9	7			
<i>Brevoortia patronus</i>	24-170	2	45-46	16	29-30	0	20-21	0	21-23	34-36	8-9	10	9	7-8			
<i>Brevoortia arctii</i>	72-82	5	45-46	14-15	30-31	0	19-20	0	21-24	33-35	8	10	9	6-8			
<i>Brevoortia tyrannus</i>	140-233	3	48	18-19	29-30	0	20-22	0	21-24	32-35	7-9	10	9	6-7			
<i>Clupea harengus</i>	150-217	4	55-57	23-25	32-33	0	17-19	0	17-18	37-41	10-13	10	9	8-9			
<i>Clupea cephalopus</i>	137-215	1	48-50	11-13	35-39	0	13-15	0	32-36	35-37	9-11	10	9	7			
<i>Clupea petenensis</i>	37-62	7	43-44	11-13	30-32	0	14-16	0	22-24	34-35	9	10	9	6-7			
<i>Clupea sedita</i>	107-125	5	48-50	15-17	32-34	0	18-21	0	11-12	31-32	6-7	10	9	6			
<i>Harengula pensacola</i>	64-77	4	40-42	12-14	27-29	0	15-18	0	17-18	33-35	8-9	10	9	6-7			
<i>Leptichthys tarroctentata</i>	27-47	8	38-42	19-21	19-21	0	10-12	0	13-15	23-24	3-4	9	8	3			
<i>Olisthona ocellum</i>	57-192	9	45-49	12-13	32-36	0	20-22	0	20-24	34-35	9	10	9	6-7			
<i>Sardinella anchovia</i>	23-29	6	45-47	16	29-31	0	16-19	0	16-17	34	8	10	9	7			
CORYPHAEIDAE																	
<i>Coryphaena equisetis</i>	77-100	4	33	14	19	0	51-54	0	24-27	40-43	11-12	9	8	12			
<i>Coryphaena hippurus</i>	91-130	4	31	13-14	17-18	0	58-60	0	27-28	39-43	11-13	9	8	10-13			
CORYPHAEINIDAE																	
<i>Coelophynchus carminatus</i>	170-205	2	75-78	12	63-66	0	-	0	-	-	-	-	-	-			
<i>Merula bairdii</i>	350	1	-	14	-	2	10	0	110	-	-	-	-	-			
CYCLOPTERIDAE																	
<i>Cyclopterus lumpus</i>	387	1	29	11	18	6	10	0	11	15	3	5	5	2			
CYNOGLOSSIDAE																	
<i>Symphurus civitatus</i>	108-132	4	47-49	9	36-40	0	90-91	0	73-75	12	0	6	6	0			
<i>Symphurus diomedianus</i>	128-181	4	48-49	9	39-40	0	90-92	0	74-76	10-11	0	5	5-6	0			
<i>Symphurus marginatus</i>	100-112	4	52-53	9	43-44	0	95-98	0	81-84	12	0	6	6	0			
<i>Symphurus minor</i>	45-50	2	43	9	34	0	75-76	0	60	10-11	0	5	5-6	0			
<i>Symphurus tigris</i>	91-106	4	47-48	9	38-39	0	84-87	0	68-72	12	0	6	6	0			
<i>Symphurus plagiatus</i>	121-135	4	46-48	9	37-39	0	86-89	0	70-72	10	0	5	5	0			
<i>Symphurus plagiatus</i>	147-194	4	50-42	9	41-43	0	94-98	0	78-83	11-12	0	6	5-6	0			
<i>Symphurus pusillus</i>	91-118	3	53-54	9	44-45	0	95-99	0	83-85	12	0	6	6	0			
<i>Symphurus srospilus</i>	96	1	44	9	35	0	85	0	69	11	0	5	6	0			
CYPRINODONTIDAE																	
<i>Cyprinodon variegatus</i>	34-54	4	26-27	12	14-15	0	12-13	0	11-12	28-29	-	-	-	-			
<i>Floridichthys carpio</i>	48	1	23	9	14	0	11	0	9	31	-	-	-	-			
<i>Fundulus grandis</i>	65-111	4	33-35	15-16	18-20	0	11-12	0	11	38-42	-	-	-	-			
<i>Fundulus heteroclitus</i>	62-72	4	33-34	14	19-20	0	11-12	0	10-11	38-40	-	-	-	-			
<i>Fundulus luciae</i>	174-32	10	31-33	12-13	18-20	0	8-9	0	10-11	33-34	-	-	-	-			
<i>Fundulus setatilis</i>	30-85	4	34-35	15	19-20	0	13-14	0	10-12	37-40	-	-	-	-			
<i>Fundulus umilii</i>	44-81	5	35-36	15	20-21	0	12-13	0	11-12	34-40	-	-	-	-			
DACTYLOPTERIDAE																	
<i>Dactylopterus volitans</i>	110-162	4	22	8	14	-	8	0	6	15	3	5	5	2			
DIOONTIDAE																	
<i>Otilowichthys schopeni</i>	60-115	5	18-20	-	-	0	10-12	0	9-11	9	0	4	5	0			
<i>Diodon holocentrus</i>	97-125	4	-	-	-	0	12-14	0	12-15	9	0	4	5	0			
<i>Diodon hystrix</i>	37-168	3	-	-	-	0	15	0	16	9	0	4	5	0			
DIREPTRIDAE																	
<i>Diretmus argenteus</i>	82-95	4	29-30	13	16-17	0	25-26	0	20-21	29	5	10	9	5			
ECHENEIDAE																	
<i>Echeneis naucrates</i>	210-268	3	30	14	16	0	34-37	0	32-35	37-40	10-11	9	8	10-12			
<i>Echeneis naucratesoides</i>	103-137	2	30	14	16	0	37	0	33	40	13	9	8	10			
<i>Phthalichthys lineatus</i>	50-81	2	36-39	18	20-21	0	35	0	35	39	11	9	8	11			
<i>Remora remora</i>	74-158	6	27	12	15	0	24-26	0	22-24	39-43	11-13	9	8	11-13			
ELDORIDAE																	
<i>Dordattator paculatus</i>	76-77	2	27	12	15	8	8	1	10	32-33	9	8	7	8-9			
ELOPIDAE																	
<i>Elops saurus</i>	180-233	4	78-80	55-56	24	0	26-28	0	18-19	36-37	9-11	10	9	7-8			
<i>Megalops atlanticus</i>	75-115	3	55-56	33-34	22	0	16	0	24-25	32-33	7	10	9	6-7			

TABLE 1.—Meristic characters of some marine fishes of the western North Atlantic Ocean.—Continued.

FAMILY	Size range SL	Specimens examined	VERTEBRAE			DORSAL FIN		ANAL FIN		CAUDAL FIN														
			Total	Precaudal	Caudal	Spines	Rays	Spines	Rays	Total	Dorsal secondary rays	Dorsal primary rays	Ventral primary rays	Ventral secondary rays										
Genus, species	mm	No.	Number																					
LABRIDAE																								
<i>Gobianus pulchellus</i>	187-215	3	26	11	17	12	10	3	11-12	32-33	9-10	7	7	9										
<i>Micropogonias parrii</i>	36	1	28	11	17	12	10	3	12	37	12	7	7	11										
<i>Mecadon puelarii</i>	115-152	4	28	11	17	11	10	3	12	34-35	10-11	7	7	10-11										
<i>Halichoeres bartolus</i>	120-137	2	25	10	15	9	11	3	12	26	6	7	7	6										
<i>Halichoeres bifasciatus</i>	123-140	4	25	10	15	9	11	3	12	26-27	6-7	7	7	6										
<i>Halichoeres maculipinna</i>	57-83	2	25	10	15	9	11	3	11	26-27	6-7	7	7	6										
<i>Halichoeres radiatus</i>	307	1	25	10	15	9	11	3	12	26	6	7	7	6										
<i>Hemipersonocheus martinicensis</i>	98	1	25	9	16	9	11	3	12	26	6	7	7	6										
<i>Hemipersonocheus novaezelandiae</i>	118-152	4	25	9	16	8-9	12-13	4	12	21-23	1-5	7	7	3-4										
<i>Lochmichthys maxillus</i>	114-122	4	30	13	17	14	11	3	10-11	26-28	6-7	7	7	6-7										
<i>Mullola nitida</i>	363	1	25	10	15	17	11	3	8	28	7	8	7	6										
<i>Thalassoma bifasciatum</i>	57	1	25	10	15	8	11	3	11	25	6	7	7	9-10										
<i>Thalassoma nitidum</i>	41-55	5	25	10	15	8	12-13	3	10-11	24-26	5-6	7	7	5-6										
LOBOTIDAE																								
<i>Lobotes gurinensis</i>	19-40	4	24	11	13	12	15-16	3	11	23-25	3-5	9	8	3										
LOPHIIDAE																								
<i>Lophius americanus</i>	86-98	2	25-26	14	11-12	-	-	0	9-10	-	-	-	-	-										
LUTJANIDAE																								
<i>Apilus dentatus</i>	202	1	24	10	14	10	9	3	8	42	13	9	8	12										
<i>Pteleis oculatus</i>	95-160	3	24	10	14	10	11	3	8	39-41	12-13	9	8	10-11										
<i>Lutjanus analis</i>	165-197	4	24	10	14	10	11	3	8	35-36	9-10	9	8	8-9										
<i>Lutjanus apodus</i>	32-49	4	24	10	14	10	10	3	8	31-33	7-8	9	8	7-8										
<i>Lutjanus aya</i>	94-172	7	24	10	14	10	14	3	9	35-37	9-10	9	8	8-10										
<i>Lutjanus buccanella</i>	92-147	4	24	10	14	10	14	3	7-8	36-37	10	9	8	9-10										
<i>Lutjanus griseus</i>	112-150	4	24	10	14	10	14	3	8	31-33	8	9	8	6-8										
<i>Lutjanus jamaicensis</i>	81-170	4	24	10	14	10	14	3	8	33-34	8-9	9	8	8										
<i>Lutjanus mahosoni</i>	66-150	4	24	10	14	10	11-12	3	8	34-36	9-10	9	8	8-9										
<i>Lutjanus synagris</i>	100-115	4	24	10	14	10	12	3	8	32-35	8-9	9	8	7-9										
<i>Lutjanus vivanus</i>	95-113	3	24	10	14	10	14	3	8	37-38	10-11	9	8	10										
<i>Opisthonotus chrysopterus</i>	157-173	4	24	10	14	10	13	3	8-9	34-35	10	9	8	8-9										
<i>Pristigaster squamiger</i>	86-178	4	24	10	14	10	11	3	7-8	39-41	11-12	9	8	10-12										
<i>Pristigaster freemani</i>	135-155	4	24	10	14	10	11	3	8	39-40	12	9	8	10-11										
<i>Pristigaster macrophthalmus</i>	55-117	7	24	10	14	10	11	3	8	44-43	11-13	9	8	12-13										
<i>Stenomizus aeneus</i>	123-144	4	24	10	14	12	11	3	8	36-38	10-11	9	8	9-10										
<i>Symphysodon typus</i>	111-123	4	25	10	15	9	10	3	7	40-42	12-13	9	8	11-12										
MALACOSTEIDAE																								
<i>Malacosteus niger</i>	90	1	47	-	-	0	18	0	21	-	-	-	-	-										
MICROPSIDAE																								
<i>Microsoma carvi</i>	31-34	2	67-68	37	30-31	0	-	0	-	23	5	7	6	5										
MORIDAE																								
<i>Brosmeius asperus</i>	135-165	4	50-51	17	33-34	0	10, 53-56	0	56-62	34-37	-	-	-	-										
<i>Laomoeus barbatus</i>	90-105	2	59	17	42	0	5-6, 59	0	67	28	-	-	-	-										
<i>Myxichthys colus</i>	115-122	4	48-49	14	34-35	0	10-11, 50-53	0	60-64	23-24	-	-	-	-										
MUOLIDAE																								
<i>Agonostoma monticola</i>	28-30	3	25	12	13	5	8	2	10	32-34	9-10	7	7	9-10										
<i>Mugil cephalus</i>	105-155	4	24	12	12	5	8	3	8	28-30	8	7	7	7-8										
<i>Mugil curema</i>	84-105	4	24	12	12	5	8	3	9	28-29	7-8	7	7	7-8										
<i>Mugil incilis</i>	35	2	24	12	12	5	8	3	9	29-30	8	7	7	7-8										
<i>Mugil trichodon</i>	58-105	4	24	12	12	5	7-8	3	8-9	28-29	7	7	7	7-8										
MULLIDAE																								
<i>Mullidichthys martinicus</i>	90-134	4	24	10	14	9	8	2	6	31	8	8	7	8										
<i>Mullus surculus</i>	97-126	4	24	10	14	9	8	2	6	33	9	8	7	9										
<i>Paromeneus maculatus</i>	113-155	4	24	10	14	8	8	2	6	34-35	10	8	7	9-10										
<i>Upeneus parvus</i>	100-134	4	24	10	14	8	8	2	6	31	8	8	7	8										
MICROPSIDAE																								
<i>Centropomus nigropunctatus</i>	24-27	4	36	16	20	0	9-11	0	16-18	30-31	6	10	9	5-6										
<i>Micropogonias aculeatus</i>	117-162	4	35	16	19	0	15	0	15	35-32	6-7	10	9	6										
<i>Micropogonias gulosus</i>	51-80	4	35-36	16	19-20	0	13-14	0	14-15	30-31	6	10	9	5-6										
<i>Micropogonias undulatus</i>	68-97	5	34	16	18	0	15	0	14	31-32	6-7	10	9	6										
<i>Micropogonias undulatus</i>	68-81	5	34	16	18	0	12-13	0	14	31-32	6-7	10	9	6-7										
<i>Micropogonias undulatus</i>	48-51	4	35	16	19	0	13-14	0	14-15	32-33	7	10	9	6-7										
<i>Conichthys coccoi</i>	20-47	4	39-40	15	24-25	0	11	0	21-23	31-32	6	10	9	6-7										
<i>Kyriopterus macrochirus</i>	53	1	35	16	19	0	12	0	20	34	8	10	9	7										
<i>Kyriopterus macrochirus</i>	44	1	37	16	21	0	14	0	14	34	8	10	9	7										
<i>Kyriopterus supralateralis</i>	100	1	34	16	18	0	12	0	14	32	7	10	9	6										
<i>Kyriopterus affinis</i>	62-76	3	35-37	15	20-22	0	13	0	18-20	34-36	8-9	10	9	7-8										
<i>Kyriopterus asperus</i>	26-68	4	37	15	22	0	12-13	0	17-18	35-37	8-9	10	9	8-9										
<i>Kyriopterus nitidus</i>	55-68	4	38	15	23	0	13	0	19-20	35-37	8-9	10	9	8-9										
<i>Kyriopterus obtusirostris</i>	42-61	2	35	15	20	0	13	0	18	34-35	8	10	9	7-8										
<i>Notoscopelus elongatus</i>	25	1	38	17	21	0	21	0	-	44	12	10	9	13										
<i>Symblophorus rufinus</i>	51-52	2	37	15	22	0	14-15	0	20-21	36-37	9	10	9	8-9										
NEOSCOPELIDAE																								
<i>Neoscopeles macrolepidotus</i>	117-136	4	31-32	14	17-18	0	13	0	12-13	34	8	10	9	7										
OOCOCHEALIDAE																								
<i>Dibranchius atlanticus</i>	75-142	3	18	5	13	-	-	-	-	-	-	-	-	-										
<i>Haliethichthys aculeatus</i>	65-87	4	17	5	12	-	-	-	-	-	-	-	-	-										
<i>Oococcheilus nasutus</i>	110-127	4	19	-	-	-	-	-	-	-	-	-	-	-										
<i>Oococcheilus parvus</i>	55-95	4	18	-	-	-	-	-	-	-	-	-	-	-										
<i>Oococcheilus vespertilio</i>	100-130	4	17-18	-	-	-	-	-	-	-	-	-	-	-										
OPHIIDAE																								
<i>Lepidion brevibarbe</i>	165-260	4	72	15	57	0	127-129	0	106-111	-	0	-	-	0										
<i>Lepidion carvina</i>	190-240	4	72-74	15	57-59	0	132-134	0	112-117	9	0	-	-	5										
<i>Lepidion jamaica</i>	210-275	4	74-75	15	59-61	0	135-139	0	114-116	9	0	-	-	5										
<i>Lepidion kallon</i>	155-165	2	71-72	14	52-58	0	130-135	0	106-115	9	0	-	-	5										
<i>Lepidion leucostomum</i>	150-180	2	71-72	14-15	57	0	128	0	108	9	0	-	-	5										
<i>Lepidion profundorum</i>	200-220	4	72	14	57	0	126-132	0	106-108	9	0	-	-	5										
<i>Ophidion bruni</i>	210-230	4	66-67	16	50-51	0	115-125	0	96-100	9	0	-	-	5										
<i>Ophidion grayi</i>	190-265	4	64-65	16	48-49	0	133-144	0	98-105	9	0	-	-	5										
<i>Ophidion hubbsi</i>	125-260	4	66-67	16	50-51	0	120-135	0	98-111	9	0	-	-	5										
<i>Ophidion walshii</i>	175-210	4	66-67	16	50-51	0	138-146	0	114-121	9	0	-	-	5										
<i>Osteichthys conostictum</i>	60-122	3	57-59	14	43-45	0	102-105	0	82-85	9	0	-	-	5										
<i>Heterostichus marginatus</i>	145-180	4	68-69	15	53-54	0	147-158	0	116-124	9	0	-	-	5										

TABLE 1.—Meristic characters of some marine fishes of the western North Atlantic Ocean.—Continued.

FAMILY	Size range SL	Specimens examined	V E R T E B R A E			D O R S A L F I N		A N A L F I N		C A U D A L F I N				
			Total	Precaudal	Caudal	Spines	Rays	Spines	Rays	Total	Dorsal secondary rays	Dorsal primary rays	Ventral primary rays	Ventral secondary rays
Genus, species	mm	No.	Number											
SCIAENIDAE														
<i>Bairdiella chrysura</i>	46-142	12	25	11	14	12	19-22	2	8-10	33-34	8-9	9	8	5-8
<i>Bairdiella ronchus</i>	135-153	2	25	11	14	11	23-24	2	8	34	9	9	8	8
<i>Oxymonacanthus</i>	150-177	3	25	13	12	11	25-27	2	10-12	25-33	6-8	9	6	5-8
<i>Oxymonacanthus lasiocarpus</i>	180-215	4	25	13	12	11	24-26	2	9	30-32	7-8	9	8	6-7
<i>Oxymonacanthus leucurus</i>	112-178	3	25	13	12	11	21-23	2	11	31-32	7-8	9	8	7
<i>Oxymonacanthus nebulosus</i>	31-220	8	25	13	12	11-12	20-27	2	10-11	29-33	6-9	9	8	5-7
<i>Oxymonacanthus notus</i>	121-130	4	27	14	13	11	28-30	2	9	30-32	7-8	9	8	6-8
<i>Oxymonacanthus regalis</i>	28-165	10	25	13	12	11	24-28	2	10-12	29-33	7-8	9	8	5-7
<i>Oxymonacanthus virescens</i>	90-175	5	25	14	11	11	27-30	2	7-8	28-31	6-7	9	8	5-7
<i>Equetus acuminatus</i>	90-104	6	25	10	15	10-11	34-40	2	6-8	30-32	7-8	9	8	6-7
<i>Equetus lanceolatus</i>	100-122	4	25	10	15	13-14	16-50	2	6	27-28	6-7	9	8	4-5
<i>Equetus punctatus</i>	77-197	5	25	10	15	13	14-19	2	7-8	29-31	7	9	8	5-7
<i>Equetus uberosus</i>	148-165	4	25	10	15	9-11	16-39	2	7	31-32	7-8	9	8	7
<i>Isopisthus parvipinnis</i>	132-173	4	25	10	15	7	20	2	19-20	30-35	7-9	9	8	6-9
<i>Larimus brevicornis</i>	152-173	4	25	10	15	11	24-28	2	6-7	29-30	6-7	9	8	6
<i>Larimus fasciatus</i>	27-130	10	25	10	15	11-12	25-27	2	6	28-31	6-7	9	8	4-7
<i>Leiostomus xanthurus</i>	27-182	15	25	10	15	11-12	29-32	2	12-13	29-33	6-8	9	8	6-8
<i>Macropodus ancylodon</i>	221-230	3	26	14	12	10-11	29-30	2	9-10	30	6-7	9	8	6-7
<i>Menticirrhus americanus</i>	171-195	4	25	10	15	11	24-25	2	7-8	32-33	8-9	9	8	7
<i>Menticirrhus vittorinus</i>	72-143	4	25	10	15	11	24-25	2	7	30-31	7-8	9	8	6
<i>Menticirrhus martinicensis</i>	210-233	2	25	10	15	11	23	2	7	31-32	8	9	8	6-7
<i>Menticirrhus saxatilis</i>	75-213	4	25	10	15	11	23-25	2	7-8	29-31	6-8	9	8	6
<i>Microgogon furcatus</i>	140-235	5	25	10	15	11	26-28	2	7-8	34-36	9-10	9	8	7-9
<i>Microgogon undulatus</i>	101-200	5	25	10	15	11	28-29	2	6	31-34	8-9	9	8	6
<i>Nebria macrops</i>	14.8-177	4	25	11	14	9	30-34	2	10	31-33	8	9	8	6-8
<i>Odontaspion dentex</i>	145-180	4	25	12	13	12	21-23	2	9	35-37	9-11	9	8	9
<i>Ophioscion costaricensis</i>	118	1	25	10	15	11	21	2	9	35	9	9	8	6
<i>Paralichthys virgatus</i>	112-153	4	29	11	18	11	29-30	2	8	28-30	6	9	8	5-7
<i>Paralichthys petenisi</i>	105-155	4	25	10	15	11	31-33	2	7	27-28	5	9	8	5-6
<i>Pogonias cromis</i>	28-163	6	24	10	14	11	21-23	2	6	32-33	8-9	9	8	7
<i>Sciaenops ocellatus</i>	20-26	5	25	10	15	11	23-25	2	7-8	32-36	8-10	9	8	7-9
<i>Stallifer lanceolatus</i>	38-108	7	25	10	15	12-13	21-24	2	7-9	30-35	7-9	9	8	6-9
<i>Stallifer rastriifer</i>	137-168	4	25	10	15	12-13	21-23	2	8-9	31-36	7-10	9	8	7-9
<i>Stallifer stellifer</i>	47	1	24	9	15	12	20	2	8	34	9	9	8	7
<i>Ubrina gracilicirrus</i>	87-174	4	25	10	15	11	22-23	2	7-8	30-33	7-8	9	8	6-
SCOMBERESOCIDAE														
<i>Scomberesox saurus</i>	51-58	5	66-67	40	26-27	0	10-11+5	0	13+6	21-25	3-4	7	8	3-6
SCOMBERIDAE														
<i>Axius thesard</i>	52-115	5	39	20	19	11-12	11-12+8	-	14+7-8	41	13	9	8	11
<i>Bathymus alletteratus</i>	38	1	39	19	20	17	12+7	-	13+7	-	-	9	8	-
<i>Bathymus pelagicus</i>	370	1	41	22	19	16	14+9	2	13+7	-	-	9	8	-
<i>Sarda sarda</i>	330	1	50	25	22	14+9	14+9	3	11+7	-	-	9	8	-
<i>Scomber japonicus</i>	170-180	4	30-31	14	16-17	10-11	12+4-5	2	11+4-5	35-38	8-11	9	8	10
<i>Scomber scombrus</i>	68	1	31	14	17	11	11+5	-	11+5	-	-	9	8	-
<i>Scomberomorus cavalla</i>	120-150	5	42-43	17	25-26	16	14-16+8-11	4	13-15+8-9	43-44	13-14	9	8	13
<i>Scomberomorus maculatus</i>	155-220	4	52-53	21	31-32	18-19	18-19+8-9	4	14-16+7-8	41	12	9	8	12
<i>Thunnus albacares</i>	580	1	39	18	21	13	12+	-	12+	-	-	9	8	-
<i>Thunnus atlanticus</i>	500	1	39	19	20	14	14+8	1	12+7	-	-	9	8	-
<i>Thunnus thynnus</i>	75	1	39	18	21	17	12+8	2	12+7	45	15	9	8	13
SCORPAENIDAE														
<i>Helicolenus dactylopterus</i>	186-210	4	25	10	15	12	12	3	5	34-36	10-12	7	7	9-10
<i>Neomerinthe besnorum</i>	75-91	4	24	9	15	12	9	3	5	26-29	7-8	7	7	5-7
<i>Neomerinthe pollux</i>	222	1	24	9	15	12	10	3	5	27	7	7	7	6
<i>Pontinus castor</i>	63-69	3	24	9	15	12	9	3	5	25-27	6-7	7	7	5-6
<i>Pontinus longipinnis</i>	108-135	4	24	9	15	12	9	3	5	27-28	7	7	7	6-7
<i>Pontinus macrolepis</i>	54-76	4	24	9	15	12	9	3	5	27-29	7-8	7	7	6-7
<i>Pontinus rathbuni</i>	83-105	3	24	9	15	12	9	3	5	27	7	7	7	6
<i>Scorpaena graffii</i>	86-127	4	24	9	15	12	9	3	5	25-26	6	7	7	5-6
<i>Scorpaena bergii</i>	71-133	3	24	9	15	12	9	3	5	27-29	7-8	7	7	6-7
<i>Scorpaena brasiliensis</i>	92-187	4	24	9	15	12	8-10	3	5	26-28	6-7	7	7	6-7
<i>Scorpaena calcarata</i>	107-135	4	24	9	15	12	9	3	5	25-27	6-7	7	7	5-6
<i>Scorpaena dispar</i>	96-106	4	24	9	15	12	9	3	5	26-27	6-7	7	7	6
<i>Scorpaena inermis</i>	73-158	3	24	9	15	12	8-9	3	5	26	6-7	7	7	5-6
<i>Scorpaena isthmensis</i>	91-122	4	24-25	9	15-16	12	9	3	5	27-29	7-8	7	7	6-7
<i>Scorpaena petricola</i>	24	1	24	9	15	12	9	3	5	26	7	7	7	5
<i>Scorpaena plumieri</i>	165-197	4	24	9	15	12	9	3	5-6	24-25	5-6	7	7	5
<i>Setarches guentheri</i>	85-110	4	24	9	14	12	9	3	5	29	8	7	7	7
<i>Trachyscorpia cristulata</i>	14.7-204	3	25	9	16	12	9	3	5	30	8	7	7	8

TABLE 1.—Meristic characters of some marine fishes of the western North Atlantic Ocean.—Continued.

FAMILY	Size range SL	Specimens examined	VERTEBRAE			DORSAL FIN		ANAL FIN		CAUDAL FIN								
			Total	Precaudal	Caudal	Spines	Rays	Spines	Rays	Total	Dorsal secondary rays	Dorsal primary rays	Ventral primary rays	Ventral secondary rays				
Genus, species	mm	No.	Number															
OPISTHOGNATHIDAE																		
<i>Lonchostethus hispidus</i>	51-84	4	28	10	18	11	18	3	16-17	23	3-4	8	8	8	3-4			
<i>Opisthognathus nigricaudus</i>	116-131	2	30	10	20	11	17	3	17	23	4	8	8	8	3			
<i>Opisthognathus maximus</i>	75-105	3	28	10	18	11	15	3	14-15	24-25	5	8	8	8	3-4			
OSTRACIIDAE																		
<i>Lactorhynchus polygona</i>	26-120	4	13	8	5	0	10	0	-	-	0	5	5	5	0			
<i>Lactorhynchus quadricornis</i>	42-118	5	14	8	6	0	10	0	-	-	0	5	5	5	0			
PEMPHRIDAE																		
<i>Pemphris schomburgkii</i>	82	1	25	10	15	5	8	3	32	29	7	9	8	5				
PERCOPHIDAE																		
<i>Bembrops anastropus</i>	130-216	4	28	9	19	6	14-15	0	17-19	34-36	10-11	8	7	9-10				
<i>Bembrops nobiliss</i>	163-192	4	30	9	21	6	16-17	0	17-18	34-36	10-11	8	7	9-10				
<i>Bembrops macronema</i>	145-160	4	28	9	16	6	14	0	17-18	36-37	11-12	8	7	10				
<i>Chrysopterus squamatus</i>	72-74	2	28	9	19	6	15	0	18	40-41	13	8	7	12-13				
PLEURONECTIDAE																		
<i>Glyptocephalus cynoglossus</i>	220-230	2	57-58	11-12	45-47	0	108-117	0	91-101	22-23	0-1	11	11	0				
<i>Foecilopectis albomarginata</i>	104-107	4	40-41	10	30-31	0	61-64	0	53-56	20	1	9	8	2				
<i>Foecilopectis beani</i>	90-104	4	41-42	10	31-32	0	63-66	0	53-56	20	1	9	8	2				
POCILLIDAE																		
<i>Gambusia affinis</i>	23-26	4	32-33	14	18-19	0	7-8	0	11	23-28	-	-	-	-				
<i>Metarrhinus formosa</i>	16-20	4	31	14	17	0	7-8	0	9	24	-	-	-	-				
<i>Pocilia latipinna</i>	20-24	4	29-30	13-14	15-17	0	13-14	0	8	30-32	-	-	-	-				
POLYMIIDAE																		
<i>Polyamia lowei</i>	108-127	4	28	12	16	5	29-30	4	15	29	6	9	9	5				
<i>Polyamia nobilis</i>	130-195	3	28	12	16	5	29-36	4	16-17	29	6	9	9	5				
POLYMYRIDAE																		
<i>Polydactylus octonemus</i>	63-66	4	24	10	14	9	11-12	3	13	41-43	12-13	9	8	12-13				
<i>Polydactylus virgatus</i>	72-24	3	24	10	14	8-9	10-12	3	12-13	-	-	9	8	-				
POMACENTRIDAE																		
<i>Abudefduf analogus</i>	115	1	25	11	15	13	12	2	10	26	6	8	7	5				
<i>Abudefduf saxatilis</i>	55-126	3	26	11	15	13	13	2	12	26-27	6	8	7	5-6				
<i>Chromis enchrysurus</i>	75-82	4	26	11	15	13	12	2	12	25	5	8	7	5				
<i>Chromis inaequalis</i>	55-60	4	26	11	15	13	12	2	11	24-25	5	8	7	4-5				
<i>Pomacentrus focus</i>	55-63	4	26	11	15	12	15-16	2	13-14	25	5	8	7	5				
<i>Pomacentrus leucostictus</i>	40-51	4	26	11	15	12-13	15	2	13	25	5	8	7	5				
<i>Pomacentrus planifrons</i>	38	1	26	11	15	12	15	2	13	25	5	8	7	5				
POMADURIDAE																		
<i>Anistremus purpuraceus</i>	119-165	2	26	10	16	11-12	17-18	3	9	42-43	13	9	8	12-13				
<i>Anistremus virginicus</i>	86-178	3	26-27	10	16-17	12	16-17	3	10-11	36-39	10-11	9	8	10-11				
<i>Conodon nobiliss</i>	135-155	4	26	10	16	12	13	3	7	39-40	11-12	9	8	11				
<i>Megastremus luteus</i>	112-190	4	26	10	16	13	11-13	3	11	35-37	10	9	8	8-10				
<i>Haemulon album</i>	161-238	2	26	10	16	12	16-17	3	7-8	39-40	12-13	9	8	9-11				
<i>Haemulon aurolineatum</i>	93-133	4	26	10	16	13-14	14-15	3	9	36-41	11-12	9	8	10-11				
<i>Haemulon chrysargyreus</i>	128	1	26	10	16	12	14	3	9	41	13	9	8	11				
<i>Haemulon flavolineatum</i>	95-135	3	26	10	16	12	14	3	8	33-36	9-10	9	8	6-9				
<i>Haemulon melanurum</i>	97-115	4	26	10	16	12	15-16	3	8	37-40	10-12	9	8	10-11				
<i>Haemulon plumieri</i>	77-227	4	26	10	16	12	15-16	3	9	37-39	9-12	9	8	10-11				
<i>Haemulon steindachneri</i>	137-160	4	26	10	16	12	16	3	9	39-41	11-12	9	8	11-12				
<i>Haemulon striatum</i>	84-102	4	26-27	10	16-17	13	13-15	3	8-9	39-42	12-13	9	8	10-12				
<i>Orthopristis chalcis</i>	117-163	4	26	10	16	12-13	15	3	10-11	41	12-13	9	8	11-12				
<i>Orthopristis chrysopterus</i>	95-101	4	26	10	16	12-13	15-16	3	13	40-42	12-13	9	8	11-12				
<i>Orthopristis ruber</i>	152-185	4	26	10	16	12	15	3	10	38-40	12	9	8	9-11				
<i>Pomadasys corviniformis</i>	125-170	4	26	10	16	12	15-16	3	7	38-39	11-12	9	8	10-12				
POMATOMIDAE																		
<i>Pomatomus saltatrix</i>	142-210	4	26	11	15	9	24-25	3	26-28	35-36	9-10	9	8	9-10				
PRILACANTHIDAE																		
<i>Cookeolus boops</i>	159	1	23	10	13	10	12	3	12	25	5	8	8	4				
<i>Prilacanthus arenatus</i>	137-168	4	23	10	13	10	14	3	14-15	26-28	5-6	8	8	5-6				
<i>Prilacanthus curvatus</i>	132	1	23	10	13	10	13	3	14	24	4	8	8	4				
<i>Prilacanthus pita</i>	89-135	4	23	10	13	10	11	3	10	24	4	8	8	4				
RACHYCENTRIDAE																		
<i>Rachycentron canadum</i>	455	1	25	11	14	10	29	2	24	41	16	9	8	8				
SCARIDAE																		
<i>Cryptotomus roseus</i>	57-67	3	25	10	15	9	10	3	9	25-27	7	7	6	5-6				
<i>Nicholsina usui</i>	117-116	3	25	10	15	9	10	3	9	28-28	7-8	7	6	6-7				
<i>Scarus croicensis</i>	69-210	3	25	10	15	9	10	3	9	25-27	6-7	7	6	6-7				
<i>Sparisoma chrysopterus</i>	67-95	3	25	10	15	9	10	3	9	28	6	7	6	7				
<i>Sparisoma radians</i>	81-121	4	25	10	15	9	10	3	9	25-27	6-7	7	6	6-7				
<i>Sparisoma rubripinne</i>	74-92	2	25	10	15	9	10	3	8-9	26-28	7-8	7	6	6-7				
<i>Sparisoma viride</i>	192	1	25	10	15	9	10	3	9	28	6	7	6	7				

TABLE 1.—Meristic characters of some marine fishes of the western North Atlantic Ocean.—Continued.

FAMILY	Size range SL	Specimens examined	VERTEBRAE			DORSAL FIN		ANAL FIN		CAUDAL FIN				
			Total	Precaudal	Caudal	Spines	Rays	Spines	Rays	Total	Dorsal secondary rays	Dorsal primary rays	Ventral primary rays	Ventral secondary rays
Genus, species	mm	No.	Number											
SPRATIDAE														
<i>Anthiscus latus</i>	191-295	4	26	10	16	10	14	3	8	10-14	13-14	8	7	12-14
<i>Centropristis ocyurus</i>	125-155	4	24	10	14	10	11	3	7	14-35	9-10	9	8	8
<i>Centropristis philadelphica</i>	101-167	4	24	10	14	10	11	3	7	14-35	9-10	9	8	7-9
<i>Centropristis striata</i>	97-150	4	24	10	14	10	11	3	7	14-35	9-10	9	8	8
<i>Cephalophis Fuja</i>	78-235	4	24	10	14	9	15	3	8-9	35-36	9-10	9	8	9
<i>Chorirhynchus macrinus</i>	82	1	24	10	14	8	12	3	6	33	8	9	8	8
<i>Dermatolepis inermis</i>	373	1	24	10	14	11	19	3	9	31	7	9	8	8
<i>Diplectrum bivittatum</i>	105-113	4	24	10	14	10	17	3	7	39-40	12	9	8	10-11
<i>Diplectrum formosum</i>	133-175	4	24	10	14	9-10	12	3	7	38-40	11-12	9	8	10-11
<i>Diplectrum radiale</i>	92-155	4	24	10	14	10	12	3	7	37	11-12	9	8	8-9
<i>Epinephelus drummondhayi</i>	275-285	2	24	10	14	11	16	3	9	37-40	10-12	9	8	10-11
<i>Epinephelus flavifimbriatus</i>	165-205	4	24	10	14	11	14	3	9	33-35	8-9	9	8	8-9
<i>Epinephelus guttatus</i>	177-205	2	24	10	14	11	16	3	8	35-37	9-10	9	8	9-10
<i>Epinephelus mystacinus</i>	148	1	24	10	14	11	14	3	9	34	9	9	8	8
<i>Epinephelus nigritis</i>	170	1	24	10	14	10	13	3	9	33	8	9	8	8
<i>Epinephelus niveatus</i>	74-146	4	24	10	14	11	13-14	3	9	33-34	8-9	9	8	7-8
<i>Epinephelus striatus</i>	100-202	2	24	10	14	11	17	3	8	36	8	9	8	9
<i>Hemianthias vivanus</i>	52-102	6	26	10	16	9-10	13-14	3	6	39-41	12-13	8	7	11-13
<i>Mycteroperca bonaci</i>	120	1	24	10	14	11	17	3	12	38	11	9	8	10
<i>Mycteroperca falcata</i>	240	1	24	10	14	11	17	3	11	38	11	9	8	10
<i>Mycteroperca interstitialis</i>	127	1	24	10	14	11	16	3	11	37	10	9	8	10
<i>Mycteroperca microlepis</i>	122-205	3	24	10	14	11	16-17	3	10-12	37	10-11	9	8	9-10
<i>Mycteroperca phenax</i>	49-56	3	24	10	14	11	16-17	3	11	37-38	10-11	9	8	9-10
<i>Mycteroperca venenosus</i>	45-393	1	24	10	14	11	16	3	11	37	10	9	8	9
<i>Oxymonacis martinicensis</i>	74-104	4	26	10	16	10	15	3	7	33	9	8	7	9
<i>Paranthias forcifer</i>	65-94	2	24	10	14	9	18-19	3	9	40	12	9	8	11
<i>Petromenton cruentatum</i>	103-125	3	24	10	14	9	14	3	8	33-34	8-9	9	8	9
<i>Pikis cubensis</i>	60-87	1	24	10	14	11	16	3	7	34-35	9	9	8	8-9
<i>Promotrogus aureorubens</i>	125-195	4	26	10	15	10	15	3	8	33-34	9-10	8	7	9
<i>Schiltsea beta</i>	52-57	4	24	10	14	10	11-12	3	7	36-38	10-11	9	8	9-10
<i>Serranulus pusillus</i>	29-44	3	24	10	14	9-10	11	3	7	34-35	9-10	9	8	7-8
<i>Serranus annularis</i>	45-66	4	24	10	14	10	12	3	7	32-33	8	9	8	7-8
<i>Serranus atrobranchius</i>	75-87	4	24	10	14	10	11-12	3	7	35-36	10	9	8	8-9
<i>Serranus cionaraja</i>	33-47	4	24	10	14	10	11-12	3	7	32	8	9	8	7
<i>Serranus sayotis</i>	59-72	4	24	10	14	10	11-12	3	6-7	37-38	10-11	9	8	9
<i>Serranus rotundus</i>	99-125	4	24	10	14	10	12	3	7	38-39	11-12	9	8	10-11
<i>Serranus rhombeus</i>	112-140	4	24	10	14	10	12	3	8	36-38	10-11	9	8	9-10
<i>Serranus subligarius</i>	60-76	4	24	10	14	10	13-14	3	7	31-32	7-8	9	8	7
<i>Serranus tabacarius</i>	48-117	4	24	10	14	10	12	3	7	34-36	9-10	9	8	8-9
<i>Serranus tortugarum</i>	49-63	3	24	10	14	10	12	3	7	33-34	8-9	9	8	8
SULFIDAE														
<i>Achirus inscriptus</i>	70-93	5	27-28	9	18-19	0	54-58	0	40-44	15-16	0	7-8	8	0
<i>Achirus lineatus</i>	84-118	3	28	9	19	0	53-58	0	40-43	16	0	8	0	0
<i>Gymnachirus melas</i>	52-117	8	35-36	9	26-27	0	60-70	0	44-51	16	0	8	8	0
<i>Trinectes maculatus</i>	60-92	4	28-29	9	19-20	0	51-55	0	41-42	16	0	8	8	0
SPARIDAE														
<i>Archosargus probatocephalus</i>	69-112	4	24	10	14	12	10-12	3	9-10	37-33	8-9	9	8	7
<i>Archosargus rhomboidalis</i>	168-195	4	24	10	14	13	10-11	3	10	39-37	8	9	8	7-8
<i>Bipodus holbrooki</i>	137-171	4	24-25	10-11	14	12-13	11-13	3	13-14	33-34	8-9	9	8	8
<i>Lasdon rhomboides</i>	72-76	4	24	10	14	12	11	3	11	34-38	10-11	9	8	7-10
<i>Pagrus sedecim</i>	129-162	4	24	10	14	12	10	3	8	35-37	9-10	9	8	9-10
<i>Stenotomus caprinus</i>	109-148	4	24	10	14	12	12	3	11-12	33-34	9	9	8	7-8
<i>Stenotomus cryzopus</i>	107-144	4	24	10	14	12	12	3	11	34-37	9-10	9	8	8-10
SPHRAKIDAE														
<i>Sphraena borealis</i>	122-206	2	24	12	12	6	9	2	9	35	9	9	8	9
<i>Sphraena guineensis</i>	168-220	4	24	12	12	6	9	2	8	36	10	9	8	9
<i>Sphraena leucosticta</i>	254	1	24	12	12	6	9	2	9	35	9	9	8	9
STERNOMBRANCHIIDAE														
<i>Stenobrama monae</i>	70	2	30-31	10	20-21	0	12-13	0	11-12	39-41	10-11	10	9	10-11
STERNOPYGIDAE														
<i>Aryztopaleus aculeatus</i>	50-57	4	35-36	11	24-25	0	9	0	7-7	32-36	7-11	10	9	5-6
<i>Aryztopaleus affinis</i>	51-57	4	38-39	11	27-28	0	7-9	0	7-5	-	9-10	10	9	-
<i>Aryztopaleus rufus</i>	52	1	39	11	28	0	9	0	7-5	-	9	10	9	-
<i>Aryztopaleus hamisymus</i>	19-21	2	38	11	27	0	-	0	-	-	-	-	-	-
<i>Polyipmus anteroides</i>	50-67	4	33	10	25	0	11-15	0	15-17	35-36	9-11	10	9	6-7
<i>Polyipmus internatus</i>	27-40	4	33-34	10	23-24	0	11-15	0	15-16	36	10	10	9	7
<i>Sternopyx diaphana</i>	32-47	5	29-30	11	18-19	0	9-11	0	14	33-35	7-8	10	9	7-8
STROMATEIDAE														
<i>Cubicus melanus</i>	128-164	4	30-31	15-16	15	12	15-16	3	14-15	35-37	9-10	9	8	9-10
<i>Cubicus nigripagenteus</i>	100-115	4	31	15	16	12	15	3	15	35-37	9-10	9	8	9-10
<i>Nomeus gronovii</i>	88-138	4	41-42	16	25-26	12-13	27-28	2	26-27	34-35	8-9	9	8	9
<i>Yerilus leucidodus</i>	61-77	4	30	13	17	3	44-43	3	41-43	28	6	9	8	5
<i>Yerilus paru</i>	178	1	30	13	17	3	43	3	40	29	6	9	8	6
<i>Poronotus triscentus</i>	115-120	4	32	12	20	3	43-47	3	39-44	31-44	7-9	9	8	7-8
<i>Faenes cyanophrys</i>	67-123	4	31	14	17	11	25-26	3	26-27	33-34	8-9	9	8	8
<i>Faenes pacificus</i>	75-112	3	31	14	17	10-11	25-28	3	24-25	32-34	8-9	9	8	7-8
<i>Faenes pepulus</i>	83-193	4	31	14	17	12-13	14-15	3	14-15	36-41	10-12	9	8	9-12
<i>Tetragnorhus atlanticus</i>	160	1	45	23	22	15	9	2	9	36	11	8	7	10
STYLOPORIDAE														
<i>Stylochorus chordatus</i>	215	1	53	-	-	-	-	-	-	-	-	-	-	-
SYNGNATHIDAE														
<i>Hippocampus erectus</i>	105-180	4	49-51	13	36-38	0	19-20	0	-	0	0	0	0	0
<i>Micrognathus crinigerus</i>	65	1	56	17	39	0	-	0	-	-	-	-	-	-
<i>Syngnathus dunckeri</i>	47-52	4	50-53	18	32-35	0	-	0	-	-	-	-	-	-
<i>Syngnathus alucens</i>	40	2	49-50	18	31-32	0	-	0	-	10	-	-	-	-
<i>Syngnathus floridae</i>	115-122	3	51-52	18	33-34	0	-	0	-	-	-	-	-	-
<i>Syngnathus fuscus</i>	108-295	4	55-60	19-21	36-39	0	35	0	-	10	-	-	-	-
<i>Syngnathus louisianae</i>	175-240	4	51-52	19-20	36-38	0	-	0	-	-	-	-	-	-
<i>Syngnathus mackayi</i>	165-240	4	50-53	20	36-38	0	27-28	0	-	-	-	-	-	-
<i>Syngnathus palmarum</i>	72-102	4	49-52	18	31-33	0	28-29	0	-	10	-	-	-	-
<i>Syngnathus acorelli</i>	87-95	4	49-51	17-18	31-33	0	29-32	0	-	-	-	-	-	-
<i>Syngnathus springeri</i>	55-263	7	61-62	24-25	37-38	0	-	0	-	10	-	-	-	-

TABLE 1.—Meristic characters of some marine fishes of the western North Atlantic Ocean.—Continued.

FAMILY	Genus, species	Size range SL	Specimens examined	VERTEBRAE			DORSAL FIN		ANAL FIN		CAUDAL FIN				
				Total	Precaudal	Caudal	Spines	Rays	Spines	Rays	Total	Dorsal secondary rays	Dorsal primary rays	Ventral primary rays	Ventral secondary rays
		mm	No.	Number											
SYNGNODONTIDAE															
	<i>Saurida brasiliensis</i>	54-112	5	46-50	-	-	0	11	0	11	37-40	9-11	10	9	9-10
	<i>Saurida caribbaea</i>	80-108	5	52-58	-	-	0	11-12	0	11-12	40-42	11-12	10	9	10-11
	<i>Saurida normani</i>	53-330	6	49-52	-	-	0	11-12	0	10-11	41-45	11-13	10	9	11-13
	<i>Saurida suspicio</i>	32-72	5	49-52	-	-	0	10-11	0	10-11	38-40	10-11	10	9	9-10
	<i>Synodus foetens</i>	89-345	5	56-61	-	-	0	11-12	0	12	41-43	11-12	10	9	11-12
	<i>Synodus intermedius</i>	62-190	5	47-50	-	-	0	11-12	0	11-12	40-42	11-12	10	9	10-11
	<i>Synodus poyi</i>	60-165	8	44-46	-	-	0	10-11	0	10	39-44	10-13	10	9	10-12
	<i>Synodus saurus</i>	32-213	6	55-58	-	-	0	12-13	0	9-11	46-49	14-16	10	9	13-14
	<i>Synodus synodus</i>	35-142	6	50-57	-	-	0	12-13	0	8-9	43-49	12-16	10	9	12-14
	<i>Trachinocephalus myops</i>	84-207	5	50-57	-	-	0	11-13	0	14-15	45	13	10	9	13
TETRAODONTIDAE															
	<i>Canthigaster rostrata</i>	58	1	17	8	9	0	9	0	6	11	0	5	6	0
	<i>Lagocephalus leucigatus</i>	74-152	4	19	8	11	0	14-15	0	12-13	11	0	5	6	0
	<i>Sphoeroides cutaneus</i>	107-113	3	18	8	10	0	9	0	8	11	0	5	6	0
	<i>Sphoeroides dorsalis</i>	118-187	4	17	8	9	0	8	0	7	11	0	5	6	0
	<i>Sphoeroides maculatus</i>	99-178	3	19	8	11	0	8	0	7	11	0	5	6	0
	<i>Sphoeroides papillatus</i>	60-142	5	19-20	8	11-12	0	8	0	7	11	0	5	6	0
	<i>Sphoeroides spengleri</i>	106-125	4	17-18	8	9-10	0	8	0	7	11	0	5	6	0
	<i>Sphoeroides testudineus</i>	72-129	4	18	8	10	0	8	0	7	11	0	5	6	0
TRACHINOTIDAE															
	<i>Hoplostethus mediterraneus</i>	75-88	4	26	11	15	6	13	3	9	33-34	7-8	10	9	7
TRICANTHODIDAE															
	<i>Hollardia hollardia</i>	71-90	4	20	8	12	6	16-17	0	15	12	0	6	6	0
	<i>Parahollardia schmidti</i>	51-60	4	20	8	12	6	15	0	13	12	0	6	6	0
TRICHURIDAE															
	<i>Benthodesmus sinuori</i>	590	1	157	-	-	-	-	2	-	-	-	-	-	-
	<i>Benthodesmus tenuis</i>	430-465	4	127-132	-	-	-	121-132	2	71-81	-	-	-	-	-
	<i>Trichurus lepturus</i>	310-380	4	169-173	39-40	130-134	3	132-138	2	89-107	-	-	-	-	-
TROLIDAE															
	<i>Bellator brachyhydr</i>	55-63	4	26	10	16	11	10-11	0	11	31-33	9-10	7	6	8-10
	<i>Bellator agretta</i>	94-108	4	26	10	16	11	11	0	11	30-32	9-10	7	6	8-9
	<i>Bellator militaria</i>	61-92	3	25-26	10	15-16	11	11	0	9-10	27-30	7-9	7	6	7-8
	<i>Bellator tibiroi</i>	30-59	8	26	10	16	11	11	0	9-11	27-28	7-8	7	6	7
	<i>Priocetus alatus</i>	81-130	4	26	10	16	10	12-13	0	11	30-31	9-10	7	6	8
	<i>Priocetus beani</i>	72-133	4	26	10	16	10	12	0	11	26-31	9	7	6	6-9
	<i>Priocetus carolinus</i>	172-188	4	26	10	16	10	13	0	12	31-33	9-10	7	6	9-10
	<i>Priocetus evolvans</i>	113-157	4	26	10	16	10	12	0	11	32-35	10-11	7	6	9-11
	<i>Priocetus ophrys</i>	98-137	4	26-27	10	16-17	10	12-13	0	10-11	25-27	6-7	7	6	6-8
	<i>Priocetus parvialatus</i>	89-118	4	26	10	16	9-10	12	0	11	31-32	9-10	7	6	9
	<i>Priocetus pectoralis</i>	157-225	4	26-27	10	16-17	10	12-13	0	11-12	31-34	9-11	7	6	9-11
	<i>Priocetus punctatus</i>	97-153	4	26	10	16	10	11-12	0	11	30-35	10-11	7	6	9-11
	<i>Priocetus roseus</i>	113-145	4	26	10	16	10	12-13	0	11	29-30	8-9	7	6	8
	<i>Priocetus rubio</i>	157-173	4	26	10	16	10	12	0	10-11	31-32	9-10	7	6	9
	<i>Priocetus scitulus</i>	79-172	4	26	10	16	10	13	0	12	30-33	10-11	7	6	7-10
	<i>Priocetus stevensi</i>	98-133	4	26	10	16	9-10	12	0	10-11	33-34	10-11	7	6	10
	<i>Priocetus tribulus</i>	90-193	4	26	10	16	10	12	0	11	30-33	9-10	7	6	8-10
	<i>Paristiodon antillarum</i>	92-120	4	31	9	22	6	12	0	-	28	8	6	6	8
	<i>Paristiodon brevirostre</i>	92-96	2	32	9	23	-	-	0	-	25	7	6	6	6
	<i>Paristiodon bicoloratus</i>	127-148	4	31-35	9	24-26	8	-	0	-	25-27	7-8	6	6	6-7
	<i>Paristiodon gracilis</i>	110-130	4	34-35	9	25-26	8	-	0	21-23	27-28	8	6	6	7-8
	<i>Paristiodon greysii</i>	87-105	3	34-35	9	25-26	8	18-20	0	18-21	28	8	6	6	8
	<i>Paristiodon isorbe</i>	107-135	3	34-35	9	25-26	8	18	0	-	26-28	7-8	6	6	7-8
	<i>Paristiodon longipinna</i>	122-135	4	32-33	9	23-24	-	-	0	-	26	7	6	6	7
	<i>Paristiodon minutus</i>	118-148	4	33	9	24	-	-	0	-	26-28	7-8	6	6	7-8
	<i>Paristiodon schmidti</i>	73-94	4	31-33	9	22-24	-	-	0	-	26	7	6	6	7
	<i>Paristiodon truncatum</i>	115-133	3	33-34	9	24-25	-	-	0	19	26	7	6	6	7
	<i>Paristiodon unicuspid</i>	136-153	2	33	9	24	8	19-20	0	20	25-26	6-7	6	6	7
URANOSCOPIIDAE															
	<i>Astroscoptes guttatus</i>	230	1	25	11	14	5	13	0	13	22	5	7	6	4
	<i>Astroscoptes y-gracilis</i>	80-110	4	25	11	14	5	13-14	0	13-14	25-26	6-7	7	6	6-7
	<i>Urolophus gracilis</i>	83-125	4	28	11	17	0	12-14	0	16-17	28-29	8-9	7	6	7-8
	<i>Kathetostoma albigutta</i>	85-117	3	25	10	15	0	14-15	0	12-13	22	5	7	6	4
	<i>Kathetostoma cubana</i>	62-118	5	26	11	15	0	14-15	0	13-14	23	5	7	6	5
XIPHIIDAE															
	<i>Xiphias gladius</i>	53-170	4	26	14	12	-	52	-	-	31-32	7-9	9	8	7
ZEIDAE															
	<i>Cyttopsis roseus</i>	85-115	4	31	10	21	7	28-29	2	28-29	20-21	3-4	5	7	4
	<i>Parzen pacificus</i>	105-118	4	34	12	22	8-9	28-29	1	31-33	27-28	8-9	5	6	8
	<i>Zenopsis ocellata</i>	68-75	4	35	12	23	8-9	24-26	3	22-25	15	1	6	7	1
ZENIIONTIDAE															
	<i>Zenion hololepis</i>	60-72	4	27	11	16	5-6	26-28	1-2	22-23	18	3	6	7	2
ZOARCIDAE															
	<i>Macrourus americanus</i>	340-390	4	137-138	25-27	111-112	18-21	90-94+28-31	0	113-115	-	-	-	-	-

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FREQUENCY AND DURATION OF FLOW REVERSAL IN THE LOWER COLUMBIA RIVER, APRIL 1968-MARCH 1970

The hydraulic head generated by some heights of tide can result in changes in direction of current in the lower Columbia River when volume discharges fall below a critical value. In connection with this phenomenon, Clark and Snyder (1969) conducted a study to determine the timing and extent of reversal of flow during an extreme condition of low discharge of water from the river. They determined that flow reversals could increase the accumulation of discharged effluents per given volume of river

water by as much as 3.5 times over the accumulation at mean flow rates. Their report showed the need for a continuing record of direction of current in the lower Columbia River to determine the importance of flow reversal at different discharge rates. To help satisfy this need, a floating laboratory (Snyder, Blahm, and McConnell, 1971) was established on the lower Columbia River at river kilometer 117.5 (river mile 73) near Prescott, Oreg., where speed and direction of current were recorded. This report describes the flow-reversal phenomenon at river kilometer 117.5 from data collected between April 1968 and March 1970.

Procedure

The velocity of the river current was measured with a Savonius meter¹ suspended from the laboratory to determine the frequency and duration of flow reversal in the lower Columbia River. With the exception of 21 days, the flow was monitored continuously for a 2-year period. Flow data obtained at Prescott were related to the daily discharge of the river and to the time and height of ocean tides near the river's mouth at Astoria, Oreg.

Daily average flow for the period 1 April 1968 to 30 June 1969, was "gauged flow" furnished by the U.S. Geological Survey office in Portland, Oreg.; daily average flow for the period 1 July 1969 to 31 March 1970, was from information furnished by U.S. Geological Survey offices in Portland, Oreg., and Tacoma, Wash. Time and height of oceanic tides were for Astoria, Oreg.; these data were obtained from tide charts of the NOAA (National Oceanic and Atmospheric Administration) National Ocean Survey.

Our observations of direction and speed of current were used to determine the duration and frequency of flow reversals. Only those flow reversals of 60-min duration or longer were considered to constitute true reversals. Duration of flow reversal was defined as the time interval between positive downstream flows wherein the

¹ Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.