

LARVAL AND JUVENILE HAKES (Phycis-Urophycis sp.) EXAMINED DURING  
A STUDY OF THE WHITE HAKE, Urophycis tenuis (Mitchill), IN THE  
GEORGES BANK-GULF OF MAINE AREA.

Michael P. Fahay

1987

Department of Commerce  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service  
Northeast Fisheries Center  
Sandy Hook Laboratory  
Highlands, New Jersey 07732

Sandy Hook Laboratory Report No. 87-03

This report documents material examined during the course of a study of the first year life history stages of the white hake, Urophycis tenuis, in the Georges Bank-Gulf of Maine area (Fahay et al. in prep.). Published biological studies of hake species in the western North Atlantic are often questioned because of the possibility of misidentification of the various species, which resemble each other strongly in all ontogenetic stages. Characters used during the cited study are presented in Table 1. Capture data, lengths and meristic characters for all material examined are listed in Tables 2 through 10. Material examined is presently lodged at the Sandy Hook Laboratory (NMFS, NEFC) or at the Marine Field Station, Rutgers University, Tuckerton, New Jersey.

Table 1. Summary of meristic characters useful for the identification of four species of western North Atlantic hakes. Modal counts in parentheses.

<u>SPECIES</u>	<u>EPIBRANCHIAL</u>	<u>TOTAL CAUDAL</u>	<u>VERTEBRAE</u>	
	<u>GILL RAKERS</u>	<u>FIN RAYS</u>	<u>PRECAUDAL</u>	<u>CAUDAL</u>
<u>Phycis chesteri</u>	4-5a	28-35a	14-15a	34-36a
<u>Urophycis regia</u>	3	30-32a	13-15a (14+33)a	31-35a
<u>Urophycis chuss</u>	3	28-34a	14-15a (15+34)a	32-36a
<u>Urophycis tenuis</u>	2	33-39a	15-16 (16+34)a	33-35a
<u>SOURCE</u>	Musick 1973.	Methven 1985; Fahay and Markle 1984; Wenner 1983.	Methven 1985; Fahay 1983; Musick 1973.a	

Table 2. Summary of egg and larval (bongo net) collections in Gulf of Maine (GOM) and Georges Bank (GB), Jan. 1984-Jan. 1986. Middle- and late-stage egg identifications to genus only. Asterisk (\*) = Urophycis chuss or U. regia (not U. tenuis). Double asterisk (\*\*) = material not yet analyzed.

## JANUARY THROUGH MAY

CRUISE	INCLUSIVE DATES	# STATIONS			# EGGS	# LARVAE COLLECTED	LARVAE I.D. and SIZES
		GOM	GB				
DEL 84-01	JAN 10-24	46	28	0	0		
ALB 84-02	MAR 26-APR 25	38	36	1	0		
ALB 84-03	MAY 23-JUN 2	54	30	4	1	<u>Urophycis</u> sp. 3.1 mm	
DEL 85-01	JAN 8-26	8	33	0	1	<u>U.2 regia</u> 17.8 mm2	
ALB 85-02	MAR 24-APR 12	28	28	0	0		
DEL 85-03	APR 2-7	6	32	0	0		
ALB 85-04	MAY 9-14	8	32	0	0		
DEL 86-01	JAN 24-FEB 12	45	43	**	0		

## JUNE THROUGH DECEMBER

DEL 84-05	(No coverage on Georges Bank or Gulf of Maine)					
ALB 84-06	(No coverage on Georges Bank or Gulf of Maine)					
DEL 84-06	JUL 23-30	2	23	2303	16	<u>Urophycis</u> sp.* 1.6-8.6 mm
ALB 84-07	AUG 9-25	12	36	4014	259	<u>Urophycis</u> sp.* 1.4-5.0 mm
ALB 84-08	OCT 5-NOV 3	47	35	24	3	<u>Urophycis</u> sp.* 5.3-8.2 mm
DEL 84-09	NOV 19-DEC 5	20	31	0	2	<u>U.2 chuss</u> 2 10.5-13.1 mm2
GYR 85-07	JUL 17-22	22	0	20	0	
ALB 85-07	AUG 4-29	0	44	**	1325	<u>Urophycis</u> sp.* 1.5-5.5 mm
					29	<u>U.2 chuss</u> 2 3.5-19.0 mm2
DEL 85-07	SEP 12-22	43	34	**	1179	<u>Urophycis</u> sp.* 1.7-7.9 mm2
					174	<u>U.2 chuss</u> 2 3.2-25.3 mm
ALB 85-08		38	11	0	15	<u>Urophycis</u> sp.*
DEL 85-08	OCT 19-Nov 15	1	17	**		2.0-6.8 mm2
					12	<u>U.2 chuss</u> 2 4.1-23.8 mm
DEL 85-10	NOV 21-DEC 12	54	31	**	4	<u>Urophycis</u> sp.* 2.8-4.8 mm

Table 3. Pelagic-juvenile hakes collected in neuston sampling 1984-1987. Coverage of Georges Bank and Gulf of Maine in 1987 limited to one cruise (May-June). Pc1= Phycis chesteri; Uc1= Urophycis \_\_\_\_\_; Ur1= Urophycis regia; Ut = Urophycis tenuis. EPIBR. = epibranchial.

CRUISE	STATION	DATE	LAT(N)	LONG(	NGTH mSL)	I.D.1	EPIBR. GILL RAKERS	TOTAL CAUDAL FIN RAYS
DEL 84-01	86	25 I 84	40 42	70 3	0.5	Pc	4	34
					3.2	Ur	3	30
					3.3	Ur	3	
	90	25 I 84	40 21	70 5	0.2	Pc	4	33
ALB 84-03	94	23 V 84	40 55	69 0	9.4	Ut	2	36
	96	23 V 84	41 20	69 0	3.4	Ut	2	36
	127	27 V 84	42 09	66 2	6.2	Ut	2	36
	176	2 VI 84	42 48	70 3	0.0	Ut	2	37
DEL 84-09	106	29 XI 84	41 16	67 4	6.0	Uc	3	33
					9.0	Uc	3	32
					mut.	?	?	28
	90	19 XI 84	40 25	69 03	22.5	Ur	3	33
					25.6	Ur	3	31
	110	29 XI 84	40 37	67 41	19.8	Ur	3	33
					13.4	Uc	3	32
					22.2	Uc	3	31
	111	29 XI 84	40 46	67 19	11.81	Uc	3?mut	29?
					mut	Uc	3	30
	138	4 XII 84	42 26	70 38	26.01	Uc	3	31
					20 2	Uc	3	30
					11.9	Uc	3	32
					10.1	Uc	3	31
					10.9	Uc1	3	32
					12.7	Uc1	3	30
11.3					Uc1	3	31	
22.0					Uc1	3	31	
145	5 XII 84	43 24	70 12	13.5	Uc1	3	31	
				12.0	Uc1	3	30	
				19.4	Uc1	3	32	
DEL 85-01		8-26 I 85	(no hakes collected)					
DEL 85-03	43	8 IV 85	40 08	69 34	31.0	Pc	4	33
	25	5 IV 85	40 20	68 21	23.0	Ur	3	32
ALB 85-04	16	11 V 85	41 30	66 20	46.0	Ut	2	34
	21	11 V 85	40 40	67 05	24.0	Ut	2	36
	22	12 V 85	40 37	67 41	40.0	Ut	2	35
					45.0	Ut	2	35
					35.0	Ut	2	36
					50.0	Ut	2	35
					35.0	Ut	2	35
50.0	Ut	2	37					

Table 3 (cont.)

<u>CRUISE</u>	<u>STATION</u>	<u>DATE</u>	<u>LAT(N)</u>	<u>LONG(W)</u>	<u>LENGTH (mmSL)</u>	<u>I.D.3</u>	<u>EPIBR. GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
					38.0	Ut	2	35
					37.0	Ut	2	35
					43.0	Ut	2	37
					35.0	Ut	2	35
	43	14 V 85	40 23	68 17	47.0	Ut	2	37
					52.0	Ut	2	36
DEL 85-07	168	19 IX 85	44 20	67 43	49.0	Ut	2	36
	189	21 IX 85	42 26	70 38	21.0	Uc	3	32
					14.0	Uc	3	33
					15.0	Uc	3	29
					14.0	Uc	3	31
					15.0	Uc	3	32
					11.0	Uc	3	29
					19.0	Uc	3	30
					15.0	Uc	3	30
					11.0	Uc	3	29
					11.0	Uc	3	31
	185	21 IX 85	43 24	70 12	24.0	Uc	3	32
					29.0	Uc	3	30
					27.0	Uc	3	31
					20.1	Uc	3	31
					19.0	Uc	3	30
	113	13 IX 85	40 23	68 17	25.0	Uc	3	32
					21.0	Uc	3	30
					21.0	Uc	3	31
					15.0	Uc	3	32
					20.0	Uc	3	32
					18.0	Uc	3	31
					14.0	Uc	3	30
	150	17 IX 85	42 09	66 20	14.0	Uc	3	32
	129	14 IX 85	41 48	67 42	25.0	Uc	3	32
					27.0	Uc	3	32
					27.0	Uc	3	29
					15.0	Uc	3	32
					16.0	Uc	3	33
					11.0	Uc	3	32
					14.0	Uc	3	30
					25.0	Uc	3	33
					14.0	Uc	3	33
	121	13 IX 85	40 53	69 34	25.0	Uc	3	32
					18.0	Uc	3	31
					28.0	Uc	3	32
					21.0	Uc	3	31
					22.0	Uc	3	31
					32.0	Uc	3	31
					21.0	Uc	3	31
					20.0	Uc	3	33
					15.0	Uc	3	31

Table 3 (cont.)

<u>CRUISE</u>	<u>STATION</u>	<u>DATE</u>	<u>LAT(N)</u>	<u>LONG(W)</u>	<u>LENGTH (mmSL)</u>	<u>I.D.</u>	<u>EPIBR. GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
					26.0	Uc	3	31
	118	13 IX 85	40 51	68 59	26.0	Uc	3	33
					13.0	Uc	3	31
					20.0	Uc	3	32
					20.0	Uc	3	33
					21.0	Uc	3	32
					16.0	Uc	3	31
					15.0	Uc	3	31
					27.0	Uc	3	32
					20.0	Uc	3	32
					14.03	Uc	3	32
DEL 85-10	93	21 XI 85	40 55	69 06	23.9	Ur	3	--
					23.8	Ur	3	--
					21.0	Ur	3	--
	90	21 XI 85	40 25	69 03	7.2	Ur	3	--
					21.0	Ur	3	--
					(5 unmeasured)			
	113	24 XI 85	40 41	67 05	25.2	Ur	3	--
					25.4	Ur	3	--
					16.1	Ur	3	--
	95	22 XI 85	41 20	69 07	25.1	Ur	3	--
					24.9	Ur	3	--
					27.3	Ur	3	--
					mut	Ur	?	--
	99	22 XI 85	40 29	68 37	19.4	Ur	3	--
					28.1	Ur	3	--
					(16 unmeasured)			
	88	21 XI 85	40 08	69 34	13.4	Ur	3	--
					29.8	Ur	3	--
					(26 unmeasured)			
	107	23 XI 85	41 16	67 41	9.9	Ur	3	--
					27.6	Ur	3	--
					(25 unmeasured)			
	105	23 XI 85	41 48	67 42	9.1	Ur	3	--
					26.3	Ur	3	--
					(36 unmeasured)			
DEL 86-01	99	29 I 86	40 29	68 37	25.0	Ur	3	--
					22.0	Ur	3	--
					19.0	Ur	3	--
	105	30 I 86	41 48	67 42	17.0	Ur	3	--
					mut	Ur	3?	--
	88	24 I 86	40 08	69 34	32.0	Pc	4	33
	90	25 I 86	40 25	69 03	31.7	Pc	4	35
	112	4 II 86	40 46	67 19	33.0	Pc	4	34
	100	29 I 86	40 20	68 21	--	Ur	3	--
					(80 unmeasured)			
	113	4 II 86	40 40	67 05	10.0	Pc	4	--

Table 3 (cont.)

CRUISE	STATION	DATE	LAT(N)	LONG(W)	LENGTH	I.D.2	EPIBR.	TOTAL	
					(mmSL)		GILL	CAUDAL	
					17.5 (143 unmeasured)	Pc	4	--	
DEL 86-03	36	13 V 86	37 59	73 58	17.6	Ut	2	35	
					18.6	Ut	2	36	
					31.1	Ut	2	35	
					36.4	Ut	2	36	
					38.3	Ut	2	35	
	46	14 V 86	38 39	73 09	45.3	Ut	2	34	
					16.2	Ut	2	33	
					17.0	Ut	2	33	
	47	14 V 86	38 59	73 08	22.3	Ut	2	36	
					37.8	Ut	2	36	
	70	17 V 86	41 20	71 21	45.0	Ut	2	35	
					33.6	Ut	2	35	
	78	18 V 86	40 04	71 30	28.4	Ut	2	34	
					27.6	Ut	2	33	
	143	28 V 86	40 13	70 25	26.2	Ut	2	34	
					28.5	Ut	2	33	
	166	31 V 86	41 16	67 41	31.0	Ut	2	35	
					23.3	Ut	2	37	
	170	31 V 86	40 37	67 41	19.5	Ut	2	35	
					16.0	Ut	2?	36	
	171	31 V 86	40 46	67 19	21.2	Ut	2	35	
					26.2	Ut	2	36	
	185	2 VI 86	42 09	66 20	44.1	Ut	2	37	
					30.9	Ut	2	37	
					39.8	Ut	2	35	
	187	2 VI 86	42 28	66 20	28.0	Ut	2	37	
					203	4 VI 86	41 54	69 10	49.7
					41.7	Ut	2	38	
					40.5	Ut	2	36	
					48.0	Ut	2	36	
					212	5 VI 86	43 24	70 12	51.0
	5	8 V 86	36 09	75 06	20.4	Ur	3	33	
	48	14 V 86	39 17	72 51	32.0	Ur	3	30	
	14	10 V 86	36 53	75 19	26.2	Ur	3	30	
					22.0	Ur	3	31	
					26.0	Ur	3	30?	
DEL 87-04	112	18 V 87	41 20	69 07	30.9	Ut	2	35	
					33.4	Ut	2	36	
					41.3	Ut	2	38	
	113	18 V 87	41 32	69 26	38.9	Ut	2	37	
					31.2	Ut	2	36	
	114	18 V 87	41 39	69 09	36.5	Ut	2	37	
					30.5	Ut	2	35	
					38.2	Ut	2	35	
						29.2	Ut	2	--

Table 3 (cont.)

<u>CRUISE</u>	<u>STATION</u>	<u>DATE</u>	<u>LAT(N)</u>	<u>LONG(W)</u>	<u>LENGTH (mmSL)</u>	<u>I.D.</u>	<u>EPIBR. GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
					29.5	Ut	2	37
					33.6	Ut	2	38
	120	18 V 87	40 29	68 37	38.6	Ut	2	36
					42.0	Ut	2	37
	121	19 V 87	40 21	68 22	40.0	Ut	2	35
					43.3	Ut	2	36
					39.5	Ut	2	37
					42.0	Ut	2	35
	123	19 V 87	40 22	67 40	19.6	Ut	2	--
					24.0	Ut	2	35
					34.0	Ut	2	--
					23.1	Ut	2	36
					15.1	Ut	2	36
					19.2	Ut	2	35
					24.8	Ut	2	35
					35.0	Ut	2	36
					21.4	Ut	2	36
					25.0	Ut	2	36
					26.4	Ut	2	36
					23.5	Ut	2	39
					24.9	Ut	2	--
					33.4	Ut	2	36
					21.5	Ut	2	35
					26.2	Ut	2	36
					27.9	Ut	2	35
					20.9	Ut	2	36
					19.5	Ut	2	36
					29.8	Ut	2	--
					27.0	Ut	2	37
					28.8	Ut	2	37
					21.2	Ut	2	35
					31.2	Ut	2	35
					22.0	Ut	2	36
					(50 unmeasured)			
	130	20 V 87	41 13	66 56	46.3	Ut	2	34
					45.5	Ut	2	38
	138	20 V 87	42 02	66 50	49.2	Ut	2	38
	129	20 V 87	41 10	66 19	32.4	Ut	2	38
					44.2	Ut	2	37
					49.6	Ut	2	--
	140	21 V 87	41 58	67 25	41.9	Ut	2	--
	147	27 V 87	39 52	71 49	28.8	Ut	2	37
					33.5	Ut	2	36
					42.0	Ut	2	35
					46.2	Ut	2	35
	148	27 V 87	39 30	72 09	22.5	Ut	2	34
	154	27 V 87	39 52	73 05	41.0	Ut	2	--
					44.4	Ut	2	--
					53.5	Ut	2	--



Table 3 (con

<u>CRUISE</u>	<u>DATE</u>	<u>LAT(N)</u>	<u>LONG(W)</u>	<u>LENGTH (mmSL)</u>	<u>I.D.</u>	<u>EPIBR. GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
				46.5	Ut	2	--
				46.6	Ut	2	37
				39.0	Ut	2	--
				56.5	Ut	2	37
				53.1	Ut	2	34
				47.2	Ut	2	35
				45.0	Ut	2	--
				49.8	Ut	2	--
				51.8	Ut	2	--
				46.9	Ut	2	--
				46.9	Ut	2	--
				50.0	Ut	2	--
				57.5	Ut	2	34
				54.1	Ut	2	36
				50.5	Ut	2	--
				44.9	Ut	2	--
				47.5	Ut	2	36
				53.6	Ut	2	34
				45.0	Ut	2	--
				51.4	Ut	2	--
				50.8	Ut	2	36
				45.8	Ut	2	--
				15.7	Ut	2	37
				(26 unmeasured)			
155	28 V 87	39 39	73 23	47.5	Ut	2	35
166	29 V 87	40 19	72 43	33.4	Ut	2	34
				34.1	Ut	2	--
				49.5	Ut	2	37
				57.1	Ut	2	34
				53.2	Ut	2	38
				48.2	Ut	2	34
				48.0	Ut	2	34
				48.6	Ut	2	37
				50.3	Ut	2	35
167	29 V 87	40 44	72 40	31.5	Ut	2	--
				45.1	Ut	2	35
				48.9	Ut	2	36
				38.0	Ut	2	36
				36.4	Ut	2	36
169	29 V 87	40 40	72 07	44.1	Ut	2	36
				44.2	Ut	2	--
				44.1	Ut	2	35
177	30 V 87	41 09	71 15	48.8	Ut	2	36
				45.4	Ut	2	33
				54.8	Ut	2	36
				54.5	Ut	2	37
187	31 V 87	41 03	70 33	31.6	Ut	2	39
				41.9	Ut	2	36
				31.3	Ut	2	36

3 (con

	<u>DATE</u>	<u>LAT(N)</u>	<u>LONG(W)</u>	<u>LENGTH (mmSL)</u>	<u>I.D.</u>	<u>EPIBR. GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
				52.4	Ut	2	35
				35.0	Ut	2	37
				47.2	Ut	2	36
				42.0	Ut	2	--
				38.5	Ut	2	37
				32.0	Ut	2	37
				51.9	Ut	2	35
				50.3	Ut	2	37
				46.8	Ut	2	36
				49.0	Ut	2	35
				34.4	Ut	2	37
				38.4	Ut	2	36
				45.3	Ut	2	--
				38.9	Ut	2	36
				(11 unmeasured)			
	VI 87	40 39	60 95	38.0	Ut	2	36
				32.5	Ut	2	38
				39.9	Ut	2	35
				38.0	Ut	2	37
				40.2	Ut	2	35
				36.3	Ut	2	38
	VI 87	41 39	69 09	41.8	Ut	2	37
				34.0	Ut	2	35
				49.2	Ut	2	36
				50.7	Ut	2	38
				40.0	Ut	2	39
				38.7	Ut	2	37
				43.2	Ut	2	36
				42.2	Ut	2	36
	VI 87	41 59	68 39	38.2	Ut	2	36
				47.4	Ut	2	37
				44.6	Ut	2	--
	VI 87	43 37	68 56	38.9	Ut	2	37
				56.6	Ut	2	37
				63.8	Ut	2	35
	VI 87	44 16	66 36	52.6	Ut	2	37
				50.4	Ut	2	35
				24.2	Ut	2	35
				24.1	Ut	2	36
232	5 VI 87	43 32	66 20	49.1	Ut	2	34
				34.5	Ut	2	36
				52.5	Ut	2	37
				52.0	Ut	2	35
231	5 VI 87	44 00	66 24	56.7	Ut	2	37
238	6 VI 87	42 46	66 58	52.0	Ut	2	38
239	6 VI 87	42 43	67 28	38.8	Ut	2	35
240	6 VI 87	42 18	67 42	32.9	Ut	2	37
				33.1	Ut	2	35
				38.1	Ut	2	35

Table 3 (cont.)

<u>CRUISE</u>	<u>STATION</u>		<u>LAT(N)</u>	<u>LONG(W)</u>	<u>GTH SL)</u>	<u>I.D.</u>		<u>TOTAL CAUDAL FIN RAYS</u>	
					.6	Ut	2	36	
					.2	Ut	2	36	
					.2	Ut	2	38	
					.8	Ut	2	33	
					.9	Ut	2	35	
	247	7	7	43 08	69 01	.5	Ut	2	36
						.5	Ut	2	35
						.0	Ut	2	37
						.7	Ut	2	34
	249	7	7	42 35	69 14	.2	Ut	2	34
						.0	Ut	2	34
						.0	Ut	2	--
						.6	Ut	2	35
						.3	Ut	2	34
	240	6	7	42 18	67 42	.9	Ur	3	29

Table 4. Pelagic-juvenile *Urophycis tenuis* retrieved from feeding seabirds on Matinicus Rock, Maine (puffins) and Eastern Egg Rock (Muscongus Bay), Maine (terns). "Fish Load" refers to prey collected from one bird on one collection date. EPIBR. = epibranchial.

FISH LOAD	DATE	LENGTH		EPIBR. GILL RAKERS	TOTAL CAUDAL FIN RAYS
		mmSL	mmTL		
Puffin 1	JUN 13 '87	41.0	47.0	2	38
		52.0	58.3	2	37
		45.9	52.1	2	36
		47.4	54.1	2	37
Puffin 3	JUN 13 '87	ca.48	ca.55(mut)	?	36
		59.0	66.5	2	35
		59.5	67.0	2	36
		48.8	54.7	2	36
		61.6	69.8	2	37
		50.2	54.9	2	39
Puffin 6	JUN 20 '87	ca.53	ca.60(mut)	?	38
		49.8	55.0	2	37
		51.5	58.5	2	34?
		52.0	59.0	2	35
		52.5	59.0	2	37
		59.5	66.0	2	36
		55.0	62.0	2	37
Puffin 7	JUN 20 '87	55.0	61.5	2	38
		55.5	62.0	2	36
		52.8	58.9	2	37
Puffin 8	JUN 28 '87	66.0	73.5	2	35
		59.2	66.0	2	35
		54.1	60.0	2	35
		54.5	60.2	2	36
		(and 1 <i>U. regia</i> , 41.2 mmSL)		3	31
Puffin 9	JUL 5 '87	ca.33	ca.38(mut)	2	?
		59.0	66.5	2	36
		53.0	59.5	2	36
		47.5	54.0	2	34
		47.0	53.0	2	35
		42.5	48.0	2	35
		38.5	44.0	2	35
Tern	Uncertain (Summer, 1987)	66.0	73.0	2	35
		72.0	82.05	2	36

Table 5. Pelagic-juvenile *Urophycis tenuis* collected in a 10 m<sup>2</sup> multiple opening-closing midwater net (MOCNESS) during 18-19 June, 1986, 48-hour vertical distribution study. Location of study was eastern Georges Bank (41034.0'N x 66°49.5'W). Two specimens from ALB 84-05 (June 1984) added.

<u>STATION</u>	<u>STRATA SAMPLED</u>	<u>DIEL</u>	<u>LENGTH (mm SL)</u>	<u>EPIBRANCHIAL GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
ALB 84-05					
MOC 519.3	20-30 m0	Night	55.0	2	36
MOC 523.2	30-40 m0	Night	51.0	2	37
ALB 86-03					
M753	0-65 m0	Day	45.0	2	35
M750	0-65 m0	Night	52.0	2	34
M756	0-68 m0	Night	69.5	2	35
			53.0	2	36?
			56.5	2	35?
			48.0	2	37? (mut)
M758	50-60 m0	Night	59.0	2	37
M750	50-65 m0	Night	34.0	2	35
			43.0	2	35
M789	50-65 m0	Night	52.0	2	38
M763	50-68 m0	Night	52.0	2	35
M758	15-30 m0	Night	44.0	2	37
M752	0-15 m0	Day	31.0	2	36
M790	0-15 m0	Dawn	46.0	2	
M789	0-15 m0	Night	53.0	2	36
M763	0-15 m0	Night	49.0	2	--(mut)0

Table 6. First-~~c~~emersal juvenile Urophycis tenuis collected in the Damariscotta River estuary, Maine, incidental to a study of feeding ecology in larval cottids (Laroche 1982).

STATION	DATE	LENGTH (mm SL)	EPIBRANCHIAL GILL RAKERS	TOTAL CAUDAL FIN RAYS
3 Dodge Point	29 MAY '73	43.0	2	34
4 Wentworth Point	29 MAY '73	51.0	2R/3L	36
		61.6	2	35
		51.5	2	39
		43.0	2	37
		56.6	2	36
6 Wiley Point	14 JUL '722	88.5	2	35
		115.5	2	37
		54.0	2	37
		75.7	2	35
4 Prentiss Cove	14 JUL '72	76.8	2	36
		67.5	2	36
		91.1	2	35
5 Prentiss Cove	14 JUL '72	82.9	2	36
2 Goose Ledge	14 JUL '72	73.6	2	36
		88.0	2	37
		98.3	2	36
		96.8	2	37
		91.2	2	35
3 Perkins Point	14 JUL '72	82.1	2	36
5 Jones Cove	11 JUL '73	42.5	2	35
		59.4	2	35
		71.5	2	36
		68.0	2	35
6 Wiley Point	14 JUL '73	84.8	3	37
2 Jones Cove	3 AUG '73	66.0	2	37

Table 7. First-demersal juvenile hakes collected at Nauset Marsh (Cape Cod National Seashore) during 1985-1986. Asterisk (\*) indicates otoliths removed and analyzed. EPIBR.≠ epibranchial.

<u>STATION</u>		NUMBER COLLECTED	<u>LENGTH</u>		EPIBR. GILL RAKERS	TOTAL CAUDAL FIN RAYS
			mm SL	mm TL		
4 Hopkins Island Grass Bed	AUG 12-13, '85	5	102	121	2	37
			151	175	2	39
			89	100	2	36
			131	156	2	39
			97	111	2	37
6 Fort Hill Grass Bed	AUG 12-13, '85	3	118	139	2	36
			195	214	2	36
			162	191	2	36
5 Town Cove Drift Algae	OCT 13-14, '85	1	225	ca.250	2	37
7 Nauset Harbor Grass Bed (Night)	OCT 13-14, '85	8	202	221	2	36
			186	211	2	37
			177	191	2	34
			260	295	2	35
			183	210	2	35
			210	240	2	34
			183	210	2	36
177	207	2	37			
5 Town Cove Drift Algae	JUN 3, '86	3	88.9	102	2	38
			91.6	107	2	38
			72.3	84	2	36
6 Fort Hill Grass Bed	JUN 3, '86	6	51.1	59	2	34
			82.5	92	2	37
			63.8	73	2	33
			64.8	75	2	36
			53.8	59	2	36
			47.2	56	2	37
7 Nauset Harbor Grass Bed	JUN 3, '86	5	50.4	57	2	38
			81.1	ca.90	2	38
			63.2	76	2	35
			69.2	82	2	36
			71.1	87	2	38
3 Inlet Sand	JUN 3, '86	1	70.0	ca.85	2	37
5 Town Cove Drift Algae	JUL 29-30, '86	7	*1801	204	2	39
			*1821	214	2	37
			*1851	214	2	37

Table 7 (cont.)

<u>STATION</u>	<u>DATE</u>	<u>NUMBER COLLECTED</u>	<u>LENGTH</u>		<u>EPIBR. GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
			<u>mm SL</u>	<u>mm TL</u>		
			*1711	200	2	36
			*1761	200	2	34
			*1551	175	2	35
			*96	112	2	35
6 Fort Hill Grass Bed	JUL 29-30, '86	9	*1001	123	2	35
			*88	103	2	37
			*571	65	2	35(?)
			*741	86	2	37
			*62	70	2	35
			60	68	2	37
			56	64	2	39
			54	61	2	35
			*90	105	2	38
7 Nauset Harbor Grass Bed	JUL 29-30, '86	5	*911	112	2	37
			*861	100	2	38
			*641	80	2	37
			*1001	118	2	35
			*1051	122	2	36
5 Town Cove Drift Algae	SEP 10, '86	1	*1951	222	2	35(?)
7 Nauset Harbor Grass Bed (Day)	SEP 10, '86	11	190	212	2	37
			165	188	2	35
			150	170	2	38
			146	169	2	--
			133	148	2	--
			119	138	2	36
			172	190	2	36
			155	172	2	38
			158	174	2	36
			140	158	2	37
			129	144	2	37
7 Nauset Harbor Grass Bed (Night)	SEP 10, '86	4	*1701	192	2	35
			*1801	201	2	34
			*1551	176	2	36
			*1501	171	2	--
7 Nauset Harbor Grass Bed (Day)	OCT 14, '86	3	*1951	225	2	--
			*1841	210	2	--
			*1961	232	2	--



Table 7 (cont.)

<u>STATION</u>	<u>DATE</u>	<u>NUMBER COLLECTED</u>	<u>LENGTH</u>		<u>EPIBR. GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
			<u>mm SL</u>	<u>mm TL</u>		
7 Nauset Harbor Grass Bed (Night)	OCT 14, '86	5	*185T	207	2	--
			*182T	207	2	--
			*208T	239	2	--
			*173T	198	2	--
			*173T	194	2	--

Urophycis chuss

<u>STATION</u>	<u>DATE</u>	<u>NUMBER COLLECTED</u>	<u>LENGTH</u>		<u>EPIBR. GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
			<u>mm SL</u>	<u>mm TL</u>		
6 Fort Hill Grass Bed	OCT 13-14, '85T	2	?	ca.100	3	--
			85	--	3	32
5 Town Cove Drift Algae	JUN 3, '86	2	65.2	75	3	33
			69.4	82	3	31
6 Fort Hill Grass Bed	JUN 3T '86	1	77.0	92	3	33

Table 8. Groundfish surveys. All *Urophycis* sp. (<100 mm) collected during fall and spring surveys. EPIBR. & epibran

PART I. Fall survey ALB 85-08.

Urophycis \_\_\_\_\_

<u>STATION</u>	<u>DATE</u>	<u>LAT(N)</u>	<u>LONG(W)</u>		<u>LENGTH RANGE (mm SL)</u>	<u>EPIBR. GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
ALB 85-08							
281	23 Oct 85	42 12	68 37		1.8-50.76	3	31-326
283	23 Oct 85	41 54	68 09		0.2-101.86	3	30-336
284	23 Oct 85	42 02	67 59		3.1-107.56	3	28-326
285	23 Oct 85	42 00	67 48		1.5-87.6	3	30-316
286	23 Oct 85	42 04	67 47		4.5-87.5	3	28-326
287	23 Oct 85	42 14	67 39		0.0	3	316
295	24 Oct 85	41 08	66 59		4.2-56.3	3	31-326
296	24 Oct 85	41 15	66 46	11	5.2-62.5	3	30-326
297	24 Oct 85	41 23	66 25		1.4-50.6	3	29-326
298	24 Oct 85	41 19	66 11	15	1.0-55.76	3	29-336
299	25 Oct 85	41 24	66 08		0.0-42.1	3	30-326
300	25 Oct 85	41 28	65 57		0.6	3	316
301	25 Oct 85	41 38	65 54		7.8-53.7	3	30-326
311	31 Oct 85	42 22	69 28		3.9	3	31
316	31 Oct 85	42 37	67 48		4.0	3	29
317	31 Oct 85	42 24	67 52		3.1	3	33
321	01 Nov 85	42 29	66 17		4.8	3	29
334	02 Nov 85	42 43	66 26		2.8-108.2	3	32(all)
335	02 Nov 85	42 51	66 35		3.1-93.2	3	31-356
339	03 Nov 85	43 10	66 59		3.0	3	30
340	03 Nov 85	43 11	66 46		0.0	3	30
346	04 Nov 85	44 40	66 12		2.0	3	30
356	05 Nov 85	43 16	67 31		1.1-65.6	3	29(all)
376	12 Nov 85	41 46	70 16		3.9-81.5	3	28-316
379	12 Nov 85	41 54	70 17		4.8-74.2	3	30
380	13 Nov 85	42 03	70 30		7.8-50.9	3	30-316
391	13 Nov 85	42 25	70 49		1.1-85.9	3	29-326
DEL 85-08							
78	6 Oct 85	38 44	73 46		5.8-47.2	3	29-316
79	6 Oct 85	38 38	73 49		0.4-49.2	3	29-316
80	6 Oct 85	38 33	73 47		1.6-50.36	3	29-336
126	9 Oct 85	40 32	73 41		2.0-91.46	3	30-316
185	19 Oct 85	40 15	68 55		3.1-52.66	3	31-326
202	22 Oct 85	41 34	67 19	19	5.0-54.56	3	29-346
					1.96	2R/3L	316
208	22 Oct 85	41 25	67 55	9	3.5-54.26	3	30-34
218	23 Oct 85	40 52	68 26		7.5-40.56	3	30-326
226	24 Oct 85	41 04	68 51	20	0.0-70.96	3	29-316
374	07 Nov 85	41 49	69 52		1.3-67.46	3	30-326
					7.26	2R/3L	30

## PART II. Spring survey ALB 86-02.

Urophycis chuss

<u>STATION</u>	<u>DATE</u>	<u>LAT(N)</u>	<u>LONG(W)</u>	<u>NUMBER EXAMINED</u>	<u>LENGTH RANGE (mm SL)</u>	<u>EPIBR. GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
2	04 MAR 86	38 43	73 06	1	38.8	3	--
26	07 Mar 86	37 23	75 36	2	67.7-72.9	3	32(all)
28	07 Mar 86	37 18	75 37	1	75.5	3	32
29	07 Mar 86	37 13	75 35	1	49.4	3	32
66	10 Mar 86	35 28	75 02	4	41.1-52.3	3	32-33
67	10 Mar 86	35 39	74 55	5	40.5-92.3	3	30-312
81	13 Mar 86	37 51	75 11	1	70.2	3	332
91	13 Mar 86	38 33	74 55	2	80.5-90.0	3	31-322
92	13 Mar 86	38 39	75 01	6	61.4-87.5	3(4)	29-332
94	14 Mar 86	38 52	74 45	1	78.5	3	332
110	15 Mar 86	39 25	72 58	11	43.5-56.6	3	29-322
131	27 Mar 86	40 40	71 48	1	51.5	3	31
151	28 Mar 86	40 35	73 13	1	83.0	3	32
152	28 Mar 86	40 33	73 24	1	84.0	3	31
165	30 Mar 86	39 53	74 01	1	124.2	3	32
171	30 Mar 86	39 47	72 32	4	44.0-73.0	3	30-312

## PART III. Spring survey ALB 86-02.

Urophycis regia

29	07 Mar 86	37 13	75 35	4	42.0-59.3	3	32-332
48	08 Mar 86	35 07	75 24	4	34.9-44.7	3	29-30
66	10 Mar 86	35 28	75 02	3	47.5-49.0	3	30-322
73	11 Mar 86	36 12	75 14	10	34.1-52.6	3	30-32
74	11 Mar 86	36 24	75 16	10(of 20)	39.6-60.3	3	31-332
94	14 Mar 86	38 52	74 45	1	45.8	3	312
165	30 Mar 86	39 53	74 01	1	64.62	3	322

## PART IV. Spring survey ALB 86-02.2

Urophycis sp.

9	05 Mar 86	38 22	73 59	3 (poorly preserved)	40.0-43.7	3?	--
189	01 Apr 86	39 56	69 52	1	39.9	3	32

Table 9. Nearshore Massachusetts trawl survey. No hakes (<100 mm) collected during spring survey cruise. Data below pertain to fall cruise "Gloria Michelle" MACR 8592 only. EPIBR.& epibranchial.

<u>STATION</u>	<u>DATE</u>	<u>LAT(N)</u>	<u>LONG(W)</u>	<u>NUMBER EXAMINED</u>	<u>LENGTH RANGE (mm SL)</u>	<u>EPIBR. GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
<u>Urophycis chuss</u>							
54	12 IX 85	41 19.5	70 39	28 of 58	47.0-84.0	3	28-31
<u>Phycis chesteri</u>							
54	12 IX 85	41 19.5	70 39	2	61.9-71.8	4	34(all)

Table 10. Inquiline hakes collected from scallops during cruise ALB 85-07. All Urophycis chuss. EPIBR. = epibranchial.

<u>STATION</u>	<u>DATE</u>	<u>LAT(N)</u>	<u>LONG(W)</u>	<u>NUMBER EXAMINED</u>	<u>LENGTH RANGE (mm SL)</u>	<u>EPIBR. GILL RAKERS</u>	<u>TOTAL CAUDAL FIN RAYS</u>
207	31 VII 85	39 41	73 05	2	27.0-31.0	3	--
212	31 VII 85	39 51	73 14	8	25.1-26.0	3	--
217	31 VII 85	39 58	73 28	3	26.5-31.2	3	--
226	1 VIII 85	39 59	73 16	3	18.2-29.2	3	--
229	1 VIII 85	39 57	73 04	1	25.5	--	32
239	1 VIII 85	40 08	72 52	2	(mutil.)	3	30
244	2 VIII 85	40 30	72 52	2	31.2-34.4	3	--
249	2 VIII 85	40 30	72 14	2	28.0-29.0	3	28-312
251	2 VIII 85	40 35	72 19	3	28.0-28.9	3	28-292
256	2 VIII 85	40 45	72 10	20	26.5-32.9	3	29-322
258	2 VIII 85	40 39	72 16	9	26.0-32.6	3	28-312
260	2 VIII 85	40 37	72 06	1	29.5	3	--
267	3 VIII 85	40 46	71 51	1	29.0	3	--
269	3 VIII 85	40 44	71 52	1	31.8	3	--
272	3 VIII 85	40 56	71 40	5	29.5-38.2	3	29-312
275	3 VIII 85	40 58	70 58	5	33.5-37.5	3	29-302
				1	35.5	4	292
310	5 VIII 85	40 32	68 53	10	26.3-38.0	3	28-302
312	5 VIII 85	40 45	68 53	5	25.0-38.2	3	28-292
318	5 VIII 85	40 59	68 56	1	33.0	--	--
320	6 VIII 85	40 55	69 15	2	29.8-38.2	--	--
326	6 VIII 85	40 46	69 09	3	30.2-34.5	3	--
328	6 VIII 85	40 38	69 11	14	27.2-32.1	3	29-302
336	20 VIII 85	41 03	69 18	20 of 30	37.8-45.8	3	28-322
341	20 VIII 85	41 00	69 07	9	35.1-45.5	3	--
342	20 VIII 85	41 02	69 04	3	38.8-45.2	3	--
370	21 VIII 85	40 59	67 38	2	39.5-41.02	3	30
504	27 VIII 85	41 44	68 14	9	40.5-48.0	3	30-322
506	27 VIII 85	41 33	68 26	10	44.0-60.2	3	30-322
516	27 VIII 85	41 10	68 45	13	44.5-61.5	3	29-322
525	28 VIII 85	41 17	69 13	2	39.2-42.0	3	30(all)
570	29 VIII 85	41 46	69 52	22	32.0-49.0	3	29-322

## Literature Cited

- Fahay, M.P. 1983. Guide to the early stages of marine fishes occurring in the western North Atlantic Ocean, Cape Hatteras to the southern Scotian Shelf. *J. Northw. Atl. Fish. Sci.* 4:1-423.
- Fahay, M.P. and D.F. Markle. 1984. Gadiformes: development and relationships. *In: Ontogeny and Systematics of Fishes.* H.G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr. and S.L. Richardson (Eds.). Amer. Soc. Ichthyol. and Herpetol., Spec. Publ. No. 1.
- Fahay, M.P., K.W. Able, K.L. Heck and C.T. Roman. MS In prep. White hake, Urophycis tenuis, in the Gulf of Maine: spawning seasonality, habitat use and growth in young-of-the-year, and relationships to the Scotian Shelf population.
- Methven, D.A. 1985. Identification and development of larval and juvenile Urophycis chuss, U. tenuis and Phycis chesteri (Pisces:Gadidae) from the northwest Atlantic. *J. Northw. Atl. Fish. Sci.* 6:9-20.
- Musick, J.A. 1973. A meristic and morphometric comparison of the hakes, Urophycis chuss and U. tenuis (Pisces:Gadidae). *Fish. Bull.* 71(2):479-488.
- Wenner, C.A. 1983. Biology of the longfin hake, Phycis chesteri, in the western North Atlantic. *Biol. Oceanogr.* 3:41-75.