

## The Number of Pyloric Cæca in the Herring.

(Supplement to "An Account of the Researches on Races of Herrings carried out by the Marine Biological Association at Plymouth, 1914-15.")

By

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IN "An Account of the Researches on Races of Herrings carried out by the Marine Biological Association at Plymouth, 1914-15,"\* Dr. J. H. Orton stated that the alimentary canal of each fish investigated was preserved for the future examination of the pyloric cæca. The present note gives the results of my counting of the latter, and the accompanying table on page 328 shows the number of pyloric cæca for each individual fish enumerated in Tables III and IV of the above publication.

The results may be summarized thus:—

Number of individuals examined . . . . .	♀	475
"                    "                    " . . . . .	♂	600
		—
	Total	1075
		—

Distance from snout to end of mid-caudal ray in cm. groups.	Totals.	NUMBER OF PYLORIC CÆCA.															
		14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
19	4	—	—	—	—	1	2	—	1	—	—	—	—	—	—	—	
20	37	—	1	2	1	1	2	7	9	6	3	1	1	3	—	—	
21	113	—	—	4	6	9	26	17	14	14	10	7	3	2	1	—	
22	220	—	3	2	4	16	31	34	36	38	29	14	9	3	—	1	
23	319	1	1	5	12	10	33	45	65	52	41	26	16	9	3	—	
24	242	1	2	5	3	14	19	44	48	33	22	26	16	5	3	1	
25	119	—	1	2	4	10	7	11	17	22	22	13	5	3	1	1	
26	17	—	—	—	—	6	2	2	1	1	3	—	2	—	—	—	
27	3	—	—	—	—	—	—	1	—	—	1	—	—	—	—	1	
28	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	
All lengths.	1075	2	8	20	30	67	123	161	191	166	131	87	52	25	8	4	

\* *Journal M.B.A.*, Vol. XI, No. 1, March, 1916.

An analysis of the data shows that in the sample of fish investigated :—

- (1) The general variation in the number of cæca is from fourteen to twenty-eight, the most frequent number being twenty-one.
- (2) The length of fish from snout to end of mid-caudal ray varies from 19 to 28 cm., the most frequent length being 23 cm.
- (3) There is no appreciable difference between males and females in respect to the number of pyloric cæca.
- (4) As seen in the following table, although the mean of the number of pyloric cæca is greater in the longer fish, the successive increases are not sufficiently great to be of much significance.

Group.	No. of Fish.	No. of Pyloric Cæca. Mean.
19-22 cm.	374	20.85 ± .08
23 cm.	319	21.35 ± .09
24-28 cm.	382	21.40 ± .08
All fish		
19-28 cm.	1075	21.19 ± .05

On concluding the examination of the Plymouth samples, I thought it would be interesting to count the pyloric cæca of herring from another district, to observe if any marked differences would be revealed. Accordingly by the courtesy of Mr. J. O. Borley of the Ministry of Agriculture and Fisheries, the alimentary canals of 197 inshore herring from Lowestoft were separately labelled with the length of fish from which extracted and forwarded to me.

The results of my counting are summarized below, but it should here be noted that the "length" of fish as forwarded me was the distance from snout to the end of the longest caudal ray, and not that from snout to the end of the mid-caudal ray as utilized in the Plymouth samples :—

Distance from snout to end of longest caudal ray.	Total's.	NUMBER OF PYLORIC CÆCA.														
		16	17	18	19	20	21	22	23	24	25	26	27	32	34	
20	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
21	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
22	7	1	1	—	—	1	—	1	—	1	2	—	—	—	—	—
23	18	—	1	1	1	2	2	3	2	3	1	1	—	1	—	—
24	52	—	3	3	5	6	5	10	10	4	3	3	—	—	—	—
25	55	—	3	3	5	10	8	9	8	2	3	1	2	—	1	—
26	33	1	—	4	6	3	3	4	5	2	2	—	3	—	—	—
27	20	—	1	3	2	4	2	4	2	2	—	—	—	—	—	—
28	10	—	—	1	1	—	3	2	2	—	1	—	—	—	—	—
29	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
All lengths.	197	2	9	17	20	26	23	33	29	14	12	5	5	1	1	1

It is seen that :—

- (1) Fishes from 24 to 25 cm. from snout to end of longest caudal ray (which is approximately equivalent to from 21 to 22 cm. from snout to end of mid-caudal ray) are the most frequent.
- (2) The commonest occurring number of pyloric cæca is twenty-two, in a general variation from sixteen to thirty-four.

Considering the relatively small number of specimens examined, it is apparent that there is no marked difference from the Plymouth samples, except perhaps the occurrence of two specimens with over thirty pyloric cæca, which may or may not be significant.

TABLE SHOWING NUMBER OF PYLORIC CÆCA IN FISH ENUMERATED IN TABLES III AND IV  
OF DR. ORTON'S PUBLICATION. (See *Journal M.B.A.*, Vol. XI, No. 1, March, 1916.)

No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.
1	20	29	24	57	23	85	21	113	19	141	20	169	23	197	19	225	23
2	24	30	22	58	21	86	16	114	22	142	17	170	21	198	20	226	20
3	18	31	18	59	16	87	19	115	20	143	18	171	22	199	21	227	21
4	20	32	21	60	20	88	22	116	21	144	21	172	18	200	21	228	20
5	25	33	19	61	22	89	17	117	21	145	21	173	24	201	25	229	19
6	23	34	19	62	23	90	23	118	26	146	25	174	23	202	21	230	19
7	22	35	23	63	23	91	23	119	26	147	21	175	23	203	22	231	22
8	26	36	21	64	20	92	19	120	17	148	20	176	21	204	19	232	21
9	20	37	22	65	17	93	26	121	22	149	23	177	22	205	22	233	23
10	24	38	22	66	21	94	22	122	24	150	20	178	23	206	17	234	19
11	26	39	22	67	20	95	24	123	20	151	23	179	23	207	20	235	22
12	16	40	15	68	22	96	22	124	19	152	20	180	22	208	26	236	25
13	23	41	23	69	20	97	19	125	26	153	20	181	21	209	21	237	23
14	21	42	19	70	18	98	22	126	22	154	24	182	19	210	20	238	15
15	24	43	24	71	24	99	23	127	21	155	21	183	28	211	23	239	24
16	21	44	23	72	22	100	19	128	23	156	23	184	24	212	20	240	20
17	22	45	26	73	19	101	22	129	19	157	22	185	21	213	18	241	26
18	24	46	25	74	20	102	19	130	17	158	24	186	21	214	26	242	20
19	22	47	22	75	24	103	19	131	20	159	18	187	21	215	23	243	22
20	23	48	19	76	21	104	23	132	15	160	21	188	16	216	21	244	20
21	26	49	21	77	21	105	19	133	19	161	25	189	17	217	28	245	21
22	20	50	18	78	22	106	24	134	22	162	21	190	21	218	18	246	23
23	24	51	21	79	18	107	22	135	22	163	21	191	25	219	22	247	22
24	22	52	24	80	21	108	21	136	24	164	19	192	22	220	21	248	20
25	21	53	20	81	20	109	17	137	20	165	24	193	20	221	22	249	22
26	20	54	19	82	19	110	21	138	22	166	22	194	18	222	23	250	22
27	22	55	22	83	21	111	19	139	24	167	22	195	20	223	21	251	19
28	23	56	20	84	19	112	21	140	21	168	23	196	20	224	19	252	24

TABLE SHOWING NUMBER OF PYLORIC CÆCA—*continued*

No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.	No. of Fish.	No. of Pyloric Cæca.
253	20	285	19	317	21	349	22	381	21	413	21	445	22	477	22	509	20		
254	23	286	19	318	17	350	23	382	23	414	23	446	21	478	22	510	22		
255	18	287	20	319	18	351	25	383	21	415	23	447	19	479	19	511	23		
256	23	288	23	320	18	352	18	384	23	416	23	448	24	480	19	512	21		
257	19	289	21	321	21	353	21	385	19	417	23	449	24	481	24	513	27		
258	20	290	19	322	26	354	16	386	18	418	23	450	17	482	19	514	17		
259	23	291	20	323	24	355	24	387	19	419	21	451	24	483	23	515	21		
260	20	292	28	324	26	356	22	388	22	420	22	452	18	484	25	516	22		
261	19	293	19	325	23	357	25	389	18	421	21	453	20	485	20	517	19		
262	21	294	22	326	24	358	19	390	18	422	22	454	21	486	21	518	20		
263	24	295	16	327	22	359	21	391	20	423	19	455	20	487	23	519	24		
264	19	296	25	328	24	360	23	392	22	424	20	456	21	488	23	520	19		
265	21	297	20	329	23	361	19	393	24	425	20	457	21	489	21	521	18		
266	21	298	27	330	20	362	27	394	23	426	21	458	20	490	21	522	21		
267	20	299	21	331	21	363	20	395	24	427	19	459	21	491	22	523	21		
268	21	300	21	332	25	364	18	396	23	428	20	460	22	492	23	524	18		
269	21	301	16	333	25	365	23	397	18	429	23	461	22	493	22	525	20		
270	23	302	21	334	17	366	25	398	21	430	21	462	22	494	20	526	23		
271	21	303	21	335	19	367	16	399	23	431	22	463	24	495	20	527	20		
272	21	304	22	336	24	368	18	400	21	432	18	464	21	496	21	528	21		
273	21	305	20	337	17	369	17	401	18	433	23	465	19	497	23	529	16		
274	20	306	19	338	25	370	20	402	18	434	20	466	21	498	20	530	19		
275	26	307	22	339	19	371	21	403	20	435	18	467	21	499	21	531	20		
276	20	308	22	340	19	372	19	404	20	436	17	468	21	500	25	532	20		
277	17	309	20	341	18	373	20	405	22	437	23	469	17	501	19	533	23		
278	18	310	22	342	25	374	19	406	19	438	22	470	20	502	22	534	24		
279	21	311	21	343	22	375	18	407	24	439	20	471	19	503	19	535	19		
280	24	312	21	344	24	376	20	408	19	440	23	472	20	504	20	536	18		
281	19	313	23	345	23	377	20	409	22	441	21	473	15	505	21	537	21		
282	21	314	21	346	24	378	22	410	21	442	20	474	17	506	19	538	15		
283	19	315	22	347	20	379	25	411	19	443	18	475	21	507	22	539	20		
284	20	316	23	348	23	380	21	412	24	444	19	476	21	508	21	540	23		

TABLE SHOWING NUMBER OF PYLORIC CAECA—continued.

No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.
541	16	573	21	605	18	637	25	669	19	701	25	733	18	765	20	797	22
542	22	574	22	606	24	638	20	670	23	702	20	734	18	766	23	798	21
543	22	575	23	607	24	639	23	671	19	703	18	735	20	767	23	799	22
544	21	576	21	608	24	640	25	672	22	704	24	736	22	768	26	800	19
545	23	577	19	609	23	641	23	673	22	705	18	737	25	769	16	801	21
546	17	578	20	610	23	642	20	674	18	706	24	738	23	770	21	802	22
547	25	579	24	611	20	643	20	675	16	707	22	739	19	771	19	803	19
548	21	580	16	612	20	644	21	676	25	708	19	740	20	772	22	804	24
549	18	581	19	613	26	645	19	677	17	709	22	741	22	773	21	805	21
550	20	582	21	614	21	646	20	678	20	710	21	742	22	774	20	806	25
551	18	583	21	615	20	647	23	679	18	711	23	743	23	775	20	807	19
552	23	584	26	616	23	648	21	680	20	712	22	744	22	776	21	808	23
553	24	585	15	617	22	649	25	681	21	713	17	745	19	777	21	809	21
554	21	586	24	618	23	650	21	682	25	714	24	746	21	778	25	810	22
555	20	587	24	619	25	651	22	683	26	715	21	747	24	779	15	811	20
556	19	588	21	620	22	652	20	684	19	716	14	748	20	780	19	812	19
557	19	589	21	621	26	653	18	685	20	717	24	749	20	781	22	813	22
558	21	590	20	622	17	654	18	686	20	718	17	750	20	782	19	814	24
559	22	591	20	623	17	655	22	687	22	719	26	751	21	783	23	815	22
560	24	592	22	624	21	656	19	688	21	720	18	752	23	784	24	816	21
561	21	593	22	625	21	657	23	689	20	721	24	753	22	785	19	817	21
562	23	594	20	626	19	658	21	690	20	722	17	754	24	786	23	818	16
563	25	595	20	627	26	659	22	691	27	723	21	755	22	787	22	819	21
564	25	596	24	628	21	660	22	692	19	724	26	756	23	788	23	820	20
565	21	597	23	629	18	661	21	693	20	725	25	757	25	789	22	821	21
566	19	598	17	630	22	662	23	694	20	726	24	758	20	790	18	822	19
567	24	599	21	631	23	663	18	695	20	727	23	759	18	791	21	823	18
568	25	600	24	632	23	664	19	696	23	728	20	760	20	792	18	824	19
569	22	601	20	633	22	665	20	697	25	729	19	761	16	793	22	825	22
570	22	602	21	634	18	666	15	698	20	730	20	762	24	794	20	826	19
571	20	603	21	635	19	667	19	699	23	731	23	763	23	795	21	827	21
572	21	604	21	636	21	668	23	700	19	732	18	764	27	796	25	828	21



TABLE SHOWING NUMBER OF PYLORIC CAECA—*continued.*

No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.	No. of Fish.	No. of Pyloric Caeca.
829	25	857	24	885	20	913	25	941	27	968	24	995	23	1022	18	1049	22
830	21	858	22	886	23	914	19	942	20	969	21	996	19	1023	20	1050	23
831	22	859	21	887	25	915	20	943	16	970	16	997	19	1024	23	1051	20
832	22	860	21	888	21	916	21	944	22	971	20	998	21	1025	22	1052	19
833	21	861	20	889	22	917	25	945	22	972	20	999	23	1026	23	1053	21
834	21	862	20	890	21	918	22	946	17	973	23	1000	23	1027	20	1054	26
835	23	863	21	891	19	919	23	947	24	974	20	1001	21	1028	19	1055	23
836	22	864	19	892	23	920	20	948	24	975	26	1002	22	1029	20	1056	20
837	19	865	21	893	18	921	25	949	20	976	25	1003	21	1030	21	1057	19
838	21	866	19	894	24	922	22	950	22	977	21	1004	23	1031	24	1058	22
839	25	867	24	895	22	923	22	951	22	978	22	1005	19	1032	20	1059	21
840	20	868	25	896	24	924	20	952	22	979	24	1006	18	1033	24	1060	20
841	20	869	24	897	22	925	16	953	24	980	22	1007	22	1034	22	1061	23
842	22	870	22	898	21	926	19	954	16	981	20	1008	20	1035	16	1062	20
843	18	871	25	899	19	927	25	955	24	982	20	1009	18	1036	22	1063	23
844	22	872	24	900	22	928	22	956	22	983	19	1010	24	1037	20	1064	21
845	18	873	20	901	24	929	19	957	22	984	25	1011	21	1038	19	1065	20
846	18	874	21	902	22	930	22	958	20	985	21	1012	21	1039	24	1066	22
847	22	875	22	903	21	931	24	959	19	986	23	1013	25	1040	25	1067	19
848	18	876	19	904	27	932	24	960	23	987	18	1014	25	1041	22	1068	19
849	17	877	21	905	20	933	20	961	18	988	22	1015	23	1042	19	1069	20
850	19	878	20	906	22	934	20	962	23	989	28	1016	23	1043	22	1070	22
851	21	879	21	907	22	935	21	963	24	990	23	1017	22	1044	23	1071	21
852	23	880	23	908	21	936	17	964	20	991	23	1018	19	1045	23	1072	19
853	27	881	18	909	23	937	18	965	19	992	22	1019	22	1046	20	1073	21
854	22	882	24	910	22	938	25	966	21	993	22	1020	22	1047	26	1074	25
855	14	883	23	911	23	939	18	967	22	994	24	1021	17	1048	20	1075	21
856	22	884	18	912	21	940	20										