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Contributions to the hydrography of the waters of the
Scotian shelf. Hydrodynamics of the waters - 1936.

Author

H. B. Hachey.

Contributions to the Hydrography of the Waters
of the Scotian Shelf

Hydrodynamics of the Waters -- 1956

by

H. B. Hickey

MCS REPORT to the Biological Board of Canada

Contributions to the Hydrography of the Waters
of the Section Shelf

Hydrodynamics of the Waters -- 1936

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Introduction:

The hydrodynamic data, obtained during the Spring (May 4 and summer (August) cruises over a portion of the Section shelf during 1936, have been subjected to the usual hydrodynamic analysis (see series of HES reports under the same general title). A publication is being prepared dealing with the hydrodynamic analysis of the past three years. This report merely records the 1936 data and furnishes general information as to the water movements determined therefrom.

The surface topography and that of the isobaric surface of 50 decibars is furnished for both May and August in figure 1. These topographies are obtained by plotting the dynamic height (in dynamic centimetres) of each point of observation relative to a chosen base. Isobars are then drawn for each dynamic centimetre of gradient, and the topography of a particular isobaric surface may then be visualized. Arrow heads indicate the direction of movement while figures enclosed in circles furnish the calculated values of the water movements in cms/sec. Relative data is furnished in table 1.

The Spring Cruise:

The topography of the surface of the sea in May is indicated in figure 1(a). The dynamic heights of all points are

are expressed in dynamic centimetres and referred to station 58 as base (station having a dynamic height of 0.0). Towards the immediate coast, in the eastern part of the area, a tendency of an east to west movement is indicated which amounts to as much as 4 cms/sec. (.08 knots or 1.9 nautical miles per day). The most prominent feature however, is a convergence of offshore movements in the western portion of the area which results in a strong movement of 15 cms/sec. (.3 knots or 7.2 nautical miles per day).

In the isobaric surface of 50 decibars (figure 1b) the convergence of offshore movements in the western portion of the area also predominates without any lessening in intensity, while the eastern portion of the area exhibits a tendency towards a shoreward movement.

The August Cruise:

The topography of the surface of the sea in August, is featured by comparatively intensive gradients. When referred to station 121 as base, differences in dynamic height are as much as 15 dyn. cms. (figure 1c). Towards the immediate coast to the east, the east to west movement is most pronounced, and is as much as 28 cms/sec. (.6 knots or 13 nautical miles per day). Offshore to the eastward, a west to east drift amounting to 6 cms/sec. (.1 knots or 2.9 nautical miles per day) tends to merge with the east to west drift of the waters of the immediate coast. To the westward, a clockwise circulation about station 125 is in evidence. The magnitude of the water movements in this circulation varies between 11 and 15 cms/sec. (.2 and .3 knots or 5.3 and 7.2 nautical miles per day).

Comparison with Previous Years:

(a) Spring

The water movements in the spring of 1936 are characterized by an almost negligible east to west movement. In the two previous years, this east to west movement was quite marked. This difference may be the result of an early "spring break-up" in 1936. Definitely, but comparatively light movements of ice were in evidence in the Cape Breton region.

(b) Summer

Conditions in August, 1936 were characterized by considerable east to west movement in the eastern part of the area. In the two previous years, the tendency was for an onshore or west to east movement which practically nullified any effects of an east to west tendency. Although a tendency for an onshore and west to east movement was quite evident in 1936, the outstanding feature was the intense east to west movement in the inshore eastern part of the Scotian Shelf.

Station	Depth	Density	S. Volume (in situ)	lyn. Depth (dyn. metres)	Gradient
121	0 m.	25.41	97522	00.000	4.1
"	25 m.	25.50	97502	24.378	5.3
122	0 m.	25.11	97550	00.000	4.7
"	25 m.	25.37	97515	24.383	5.4
"	50 m.	25.58	97483	48.758	5.7
123	0 m.	25.12	97549	00.000	5.0
"	25 m.	25.19	97552	24.388	5.2
"	50 m.	25.68	97473	48.766	5.2
"	75 m.	25.75	97456	73.132	
"	100 m.	25.79	97442	97.494	
"	150 m.	26.48	97353	146.193	
124	0 m.	24.98	97563	00.000	5.2
"	25 m.	25.08	97542	24.388	5.4
"	50 m.	25.50	97490	48.767	5.3
"	75 m.	25.77	97454	73.135	
125	0 m.	24.88	97572	00.000	5.0
"	50 m.	25.47	97490	48.766	5.2
"	75 m.	25.79	97452	73.134	
"	100 m.	26.11	97411	97.492	
"	150 m.	26.84	97320	146.175	
"	200 m.	27.02	97282	194.826	
126					
50	0 m.	24.92	97568	00.000	0.1
"	25 m.	24.94	97555	24.391	0.0
"	50 m.	25.72	97469	48.769	0.0
"	75 m.	26.48	97387	73.126	
126	0 m.	24.95	97565	00.000	0.6
"	25 m.	25.03	97547	24.389	0.7
"	50 m.	25.85	97457	48.765	0.9
"	75 m.	26.03	97429	73.126	
"	100 m.	26.30	97393	97.479	
58	0 m.	24.96	97565	00.000	0.0
"	25 m.	25.43	97509	24.384	0.6
"	50 m.	25.80	97462	48.756	1.2
"	75 m.	25.93	97438	73.119	
127	0 m.	24.73	97587	00.000	1.0
"	25 m.	25.29	97522	24.389	1.1
"	50 m.	25.65	97476	48.764	1.4
128	0 m.	25.07	97554	00.000	0.7
"	25 m.	25.20	97531	24.386	1.1
"	50 m.	25.67	97474	48.762	1.3
"	75 m.	26.19	97414	73.123	
"	100 m.	26.59	97366	97.471	
"	150 m.	26.84	97320	146.143	

Table I (May data)

Station	Depth	Density	S. Volume (in situ)	Dyn. Depth (dyn. metres)	Gradient
129	0 m.	25.24	97538	00.000	0.4
"	25 m.	25.20	97531	24.384	1.0
"	50 m.	25.68	97473	48.760	1.2
130	0 m.	25.09	97552	00.000	0.6
"	25 m.	25.21	97530	24.385	1.1
"	50 m.	25.60	97481	48.762	1.2
131	0 m.	25.01	97560	00.000	1.2
"	25 m.	25.02	97548	24.389	1.3
132	0 m.	24.82	97578	00.000	1.2
"	25 m.	25.07	97543	24.390	1.2
"	50 m.	25.86	97496	48.767	1.3
"	75 m.	26.10	97422	73.127	1.3
133	0 m.	24.81	97579	00.000	0.9
"	25 m.	25.20	97531	24.389	1.0
"	50 m.	25.80	97462	48.763	1.4
134	0 m.	24.28	97630	00.000	2.6
"	25 m.	25.14	97536	24.396	2.0
"	50 m.	25.52	97488	48.773	2.1
"	75 m.	25.57	97473	73.143	
"	100 m.	25.76	97444	97.508	

Table 1. (Data for May, 1936)

Station	Depth	Density	S. Volume (in situ)	Ign. Depth (dyn. metres)	Gradient
121	0 m.	24.36	97622	00.000	0.0
"	25 m.	25.43	97509	24.392	1.4
122	0 m.	25.59	97695	00.000	1.9
"	25 m.	25.01	97549	24.406	1.9
"	50 m.	25.75	97466	48.783	2.2
123	0 m.	25.59	97715	00.000	1.5
"	25 m.	25.08	97542	24.407	1.4
"	50 m.	25.82	97460	48.782	1.9
"	75 m.	26.07	97425	73.143	
"	100 m.	26.24	97399	97.495	
"	150 m.	26.74	97329	146.178	
124	0 m.	23.45	97709	00.000	4.1
"	25 m.	24.70	97579	24.424	2.5
"	50 m.	25.73	97468	48.805	2.2
"	75 m.	26.02	97430	73.167	
125	0 m.	22.63	97787	00.000	6.6
"	25 m.	23.28	97714	24.438	3.4
"	50 m.	25.70	97471	48.836	1.6
"	75 m.	26.14	97418	73.197	
"	100 m.	26.47	97377	97.547	
"	150 m.	26.85	97319	146.221	
50	0 m.	22.76	97775	00.000	1.4
"	25 m.	25.13	97537	24.414	0.6
"	50 m.	25.92	97450	48.788	1.2
"	75 m.	26.27	97416	73.146	
126	0 m.	23.09	97743	00.000	1.5
"	25 m.	25.23	97528	24.409	1.2
"	50 m.	25.54	97486	48.786	1.5
"	75 m.	26.24	97409	73.148	
"	100 m.	26.59	97366	97.495	
58	0 m.	22.96	97756	00.000	1.5
"	25 m.	25.54	97517	24.409	1.2
"	50 m.	25.73	97468	48.782	1.9
"	75 m.	25.94	97437	73.145	
127	0 m.	21.95	97852	00.000	6.4
"	25 m.	24.23	97623	24.439	3.1
"	50 m.	25.54	97486	48.828	2.2
"	75 m.	25.91	97441		
128	0 m.	22.49	97801	00.000	1.5
"	25 m.	24.87	97562	24.421	0.0
"	50 m.	25.87	97455	48.798	0.3
"	75 m.	26.22	97411	73.156	
"	100 m.	26.32	97390	97.506	
"	150 m.	26.65	97338	146.188	

Table 2 (August data)

Station	Depth	Density	S. Volume (in situ)	Thn. Depth (dyn. metres)	Gradient
129	0 m.	22.41	97808	00.000	5.8
"	25 m.	24.29	97618	24.428	3.6
"	50 m.	25.13	97525	48.821	2.3
130	0 m.	22.60	97790	00.000	6.3
"	25 m.	23.85	97659	24.431	3.8
"	50 m.	25.41	97499	48.826	2.3
131	0 m.	22.16	97832	00.000	4.2
"	25 m.	25.00	97550	24.423	2.5
132	0 m.	21.71	97875	00.000	3.8
"	25 m.	24.55	97612	24.436	0.8
"	50 m.	25.52	97488	48.824	0.0
"	75 m.	25.92	97439	73.189	
"	100 m.	26.18	97404	97.545	
"	150 m.	26.43	97357	146.236	
133	0 m.	21.57	97908	00.000	4.3
"	25 m.	24.59	97589	24.437	1.2
"	50 m.	25.60	97481	48.821	0.8
"	75 m.	26.06	97426	73.185	
"	100 m.	26.13	97408	97.539	
134	0 m.	21.24	97920	00.000	15.3
"	25 m.	22.52	97787	24.463	9.6
"	50 m.	25.11	97527	48.877	6.2
"	75 m.	25.91	97440	73.248	
"	100 m.	26.23	97399	97.603	

Table 1 (August data)