https://doi.org/10.17895/ices.pub.9489

5.

First Annual Report on Vertical Log Observations in the Southern North Sea and Eastern English Channel.

By

J. N. Carruthers
(Fisheries Laboratory, Lowestoft).

NOTE: The following paper was written for publication here to meet the requirements of a recommendation which is duly quoted.

In Volume CVII of this series issued a year ago, I published a paper entitled:—"Continuous Current Measuring from Lightvessels—Review of Progress, with Results for a third Winter—1937/38." That paper made reference to two earlier ones on the same subject published in the two immediately preceding years, and it concluded with the following words:—"It is not proposed to publish another paper on this subject next year; workers who find the data of interest and use, will be able to obtain them on application." By long-standing arrangement, it was intended to publish bald summaries of the observations in the pages of the Bulletins Hydrographiques of future years. That course is now no longer possible as the result of decisions taken when the future content of the Bulletin was discussed recently. The data have proved of sufficient interest for requests to be sent in for them, and to minimise the clerical trouble of meeting such requests from time to time, a convenient arrangement has been made. Monthly summary sheets are sent as a routine matter to certain addresses, and an exchange of data is maintained between the Lowestoft Laboratory and Dr. J. van Veen, Chief Engineer of the Rijkswaterstaat's appropriate department at The Hague. By courtesy of Dr. van Veen, I am able to place the results of Dutch continuous measurements made with the Vertical Log aboard several lightvessels, at the disposal of readers of this present paper. The position concerning future publication of the non-stop current data here in question, is governed by a recommendation adopted at the Council's meeting in May 1938. The relevant passages (from Part I of Volume CVII) of the Rapports et Procès-Verbaux follow, and the present paper is their outcome.

"Le Professeur Schulz propose que les mesures de courant prises à bord des bateaux-phare avec le loch vertical . . . . . fassent objet d'un rapport . . . . . et soient publiés dans le Rapport Administratif." This gave rise to a recommendation as follows:—

"Il est recommandé que les mesures de courant et les valeurs moyennes des courants observés,—surtout à bord des bateaux-phares,—ne soient pas incorporées dans le Bulletin mais soient publiées avec quelques commentaires dans le Rapport Administratif."

The present writer was appointed to do the reporting.

These quotations amply explain the appearance of the present report, but it has necessarily required some thought to decide how best to meet the requirements of the recommendation. Presumably, if the proposed "Annales Biologiques" comes into existence, such data as those here in question would go into its pages from year to year. All things considered, it seems inevitable that the present paper must be made sufficiently comprehensive to provide a back ground adequate to permit the required comments concerning year-to-year variations to be made. There is an obvious need to set down whatever data we present below, in a form which makes easy the addition of new results from year to year, and which facilitates the comments asked for by the recommendation.

With these desiderata in mind, it has been decided to restrict attention to monthly summaries, and to set these down in a manner which will let any reader who so desires, strike average values for whatever groups of months may interest him with the least possible trouble. The material with which we shall be concerned, consists entirely of results coming from the continuous operation of Vertical Logs aboard lightships. The working depth aboard the English lightvessels (and the French one too) is in all cases about $1^1/_2$ fathoms. From the Dutch lightships the observations are made at the depth of 10 metres.

Varne Lightvessel*).

Month and Year	Mileage Run (Daily Averages) of the Tidal Streams towards stated Octants of the Compass									Residual Current		Residual Wind		Average Wind Strength
	NNW. NNE. N.	NNE. ENE. N.E.	ENE. ESE. E.	ESE. SSE. S.E.	SSE. SSW. S.	SSW. WSW. S.W.	WSW. WNW. W.	WNW. NNW. N.W.	All					
March 1938....	0·46	9·40	0·27	0·06	0·13	7·11	1·21	0·03	18·67	2·1	N. 9°E.	3·6	S.48°W.	7·7
April —	0·44	7·56	0·50	0·12	0·17	10·82	0·67	0·16	20·44	3·2	S.40°W.	6·2	N.15°E.	11·4
May —	0·06	11·84	0·07	0·04	0·01	9·94	0·03	0·02	22·01	2·0	N.34°E.	1·7	N. 8°W.	9·7
June —	0·05	11·17	0·01	0·00	0·04	7·55	0·05	0·01	18·88	3·6	N.33°E.	8·0	S.41°W.	10·6
July —	0·07	15·07	0·02	0·02	0·00	9·40	0·03	0·01	24·62	5·8	N.34°E.	6·2	S.35°W.	8·9
August —	0·02	13·52	0·03	0·02	0·00	10·81	0·02	0·03	24·45	2·7	N.34°E.	2·4	S.87°W.	7·9
September —	—	9·11	0·01	0·01	—	7·71	—	0·01	16·85	1·4	N.34°E.	1·8	S.55°W.	9·1
October —	0·09	9·32	—	0·00	—	6·11	0·01	0·02	15·55	3·3	N.33°E.	11·2	S.54°W.	16·9
November —	—	10·46	—	—	—	5·43	0·00	0·00	15·89	5·0	N.34°E.	12·3	S.47°W.	15·6
December —	—	10·77	—	—	—	6·94	—	—	17·71	3·8	N.34°E.	4·4	S. 9°E.	16·0
Mean...	0·12	10·82	0·09	0·03	0·04	8·18	0·20	0·03	19·51	2·6	N.31°E.		N.W.O.	N.W.O.
January 1939....		11·77				6·86			18·63	4·9	N.34°E.	7·6	S.36°W.	17·2
February —		10·56				7·69			18·25	2·9	N.34°E.	7·7	S.42°W.	12·8
March —		8·04				7·70		0.06	15·80	0·3	N.25°E.	5·2	N.33°W.	14·3

*) Concerning the entries in the last three columns, see page 40 (bottom — right). In this and the four following tables, the pairs of three-letter directions above the mileage run columns denote the magnetic compass limits of the octants. The row beneath gives the magnetic directions upon which the latter are centred.

Acknowledgement is made once more of kind co-operation on the part of the Office Scientifique et Technique des Pêches Maritimes in the case of the Sandettié measurements. A Vertical Log in use from the Horns Rev lightship is worked as part of a programme under the direction of Dr. Å. V. TÅNING. With the exceptions of the Sandettié, Galloper, and Horns Rev lightvessels, the observing is in train all the year round and without any break on account of bad weather. From the three named light-vessels the observing is done only during the Winter months. The three months December, January, and February, hold most of immediate interest to fishery research workers in the southern North Sea—for obvious enough reasons. We shall below bring together the results for the past three winters so that those for Winter 1938/39 may be compared with them. It is desirable to do this both in the interest of easy future additions, and because they have not hitherto been made available in the form in which they appear below. By tabulating the mean daily run of the streams towards the various cardinal and intercardinal direction-sectors, we put the data into a form which permits them to be averaged at wish with facility. In the cases of the lightships from which observing goes on all the year round, it has been thought necessary to present the monthly summaries for the whole time that the Vertical Log has been in use. This done and only thus, the present paper will serve as the starting point for the annual reports required by the recommendation mentioned above.

Attention should be drawn to the portion of a Dutch graph which appeared at the end of my last year's paper. It portrayed for each day of November and December 1937, more or less all the details concerning wind at and water movement past the Maas lightship, which one could wish to know. Such a graph for an entire year and showing even more detail has since been prepared by Dr. VAN VEEN, and its existence should be made known to those interested in the water movements along the continental coast. It is not known whether such an all-year graph will be prepared every year by the Rijkswaterstaat, nor whether, if it is, it will be extended to the other lightvessels from which the Dutch observations are made.

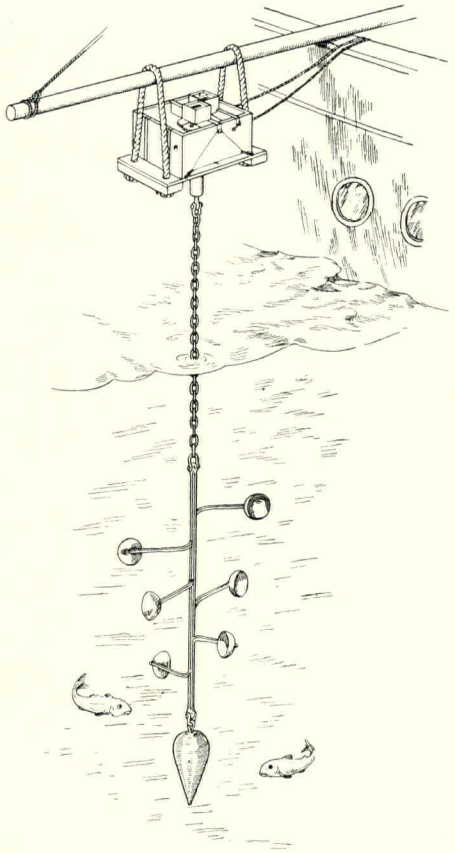
A new departure on the part of Dr. VAN VEEN's office is the preparation each month of a small chart of the southern North Sea, showing at the position of each lightship engaged in the work (not only Dutch) arrows representing average water flow and average wind flow. It has been remarked that such charts constitute fitting material for the future Biological Annals.

The Instrument.

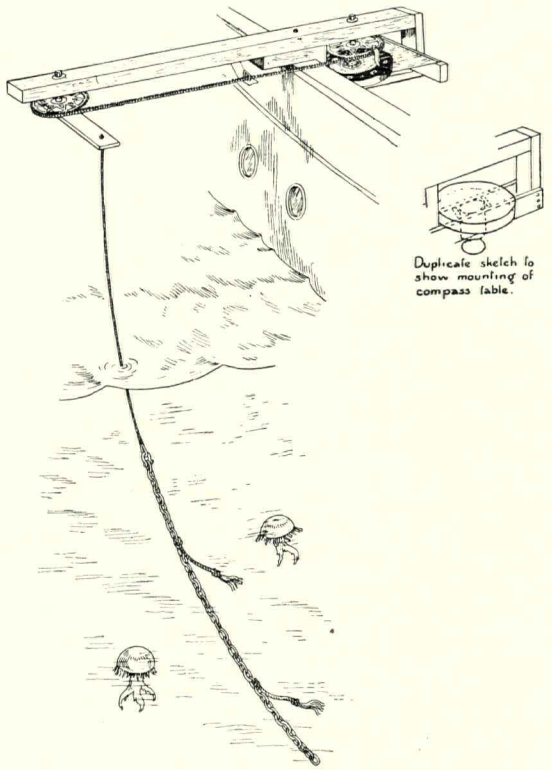
More Vertical Logs have come into existence since last year, and the instrument has quite definitely taken on its final form—at any rate so far as the Lowestoft Laboratory is concerned. What this is, can be seen from the diagram which accompanies this paper. It should be mentioned however, that when the makers recently supplied two of the instruments to a certain purchaser, they incorporated various improvements and refinements which make for convenience but are not really essential, and which do not therefore figure in the accompanying illustration.

The under-water part is seen to be the same as

~ Final Form of ~
The Vertical Log Current-Meter.



Measuring Unit.



Direction-Viewing Unit.

that described last year as being in use from the Dutch lightvessels. As to the registering part:— one of the large counters is now used for the main flood direction and another for the main ebb direction—besides that one employed as a totaliser. The direction-viewing unit has been improved by the use of bicycle chain in place of cord. No further modifications whatsoever are contemplated. It has now become a matter of pure routine to receive from lightships, monthly batches of records covering almost every day of the month. Upkeep costs are quite negligible—so much so that from some ships, nothing at all in the way of supplies has been asked for in the course of a whole year.

Records Available.

It is expected that in future reports, it will be possible to discuss any noteworthy features of the surface currents (actually sub-surface) off the Yorkshire coast. This project should be of interest as promising to reveal changes on the part of the main south-going stream off the English coast. It will be possible as the result of experience gained from monthly liberations of Route-Indicating bottle systems along a line stretching out from Flamborough Head. In the present paper however, attention is restricted to non-stop observations made aboard lightvessels with the Vertical Log.

Cromer Knoll Lightvessel.

Month and Year	Mileage Run (Daily Averages) of the Tidal Streams towards stated Octants of the Compass									Residual Current		Residual Wind		Average Wind Strength
	NNW. NNE. N.	NNE. ENE. N.E.	ENE. ESE. E.	ESE. SSE. S.E.	SSE. SSW. S.	SSW. WSW. S.W.	WSW. WNW. W.	WNW. NNW. N.W.	All					
August 1936....	1·65	0·06	0·64	9·95	0·32	0·11	0·27	8·02	21·02	1·7	N.81°E.	3·8	S.72°W.	6·5
September —	0·91	0·17	0·71	10·68	0·22	0·19	0·28	9·74	22·90	1·1	N.78°E.	2·3	N. 8°W.	12·1
October —	0·31	0·22	0·42	11·12	0·39	0·27	0·33	9·75	22·81	1·5	S.54°E.	9·5	N.69°W.	18·8
November —	0·53	0·16	0·31	8·89	0·24	0·15	0·19	8·64	19·11	0·3	N.58°E.	5·6	S.67°W.	15·3
December —	0·28	0·21	0·26	10·50	0·14	0·12	0·13	9·00	20·64	1·5	S.67°E.	13·3	S.60°W.	18·4
Mean...	0·74	0·16	0·47	10·23	0·26	0·17	0·24	9·03	21·30	1·1	S.81°E.		N.W.O.	N.W.O.
January 1937....	0·24	0·18	0·27	11·52	0·19	0·16	0·21	10·60	23·37	0·9	S.62°E.	7·5	S. 3°W.	18·5
February —	0·34	0·27	0·47	11·68	0·18	0·11	0·22	10·03	23·30	1·8	S.71°E.	9·6	S.64°W.	16·6
March —	0·19	0·14	0·24	10·85	0·29	0·28	0·37	10·25	22·61	0·6	S.28°E.	1·8	N.13°W.	14·1
April —	0·17	0·13	0·17	10·56	0·22	0·18	0·23	9·79	21·45	0·8	S.46°E.	3·3	N.30°W.	9·7
May —	0·17	0·09	0·14	10·08	0·16	0·18	0·20	10·13	21·15	0·2	S.75°W.	1·0	S.76°E.	7·4
June —	0·15	0·09	0·16	11·16	0·15	0·17	0·12	10·46	22·46	0·7	S.52°E.	3·5	N.84°W.	8·4
July —	0·18	0·14	0·18	10·89	0·17	0·12	0·17	10·10	21·95	0·8	S.58°E.	4·1	S.85°W.	9·4
August —	0·14	0·11	0·17	9·10	0·22	0·19	0·18	8·79	18·90	0·4	S.34°E.	1·9	N.51°W.	7·6
September —	0·19	0·15	0·18	8·96	0·16	0·13	0·13	8·63	18·53	0·3	S.68°E.	5·7	N.84°W.	13·8
October —	0·14	0·11	0·15	8·34	0·16	0·15	0·16	8·25	17·46	0·1	S.21°E.	1·9	N.13°E.	13·3
November —	0·18	0·13	0·16	7·55	0·13	0·12	0·18	7·38	15·83	0·1	S.73°E.	2·2	N.35°W.	14·3
December —	0·19	0·13	0·20	9·23	0·24	0·20	0·30	9·34	19·83	0·2	S.74°W.	2·3	N.51°W.	12·6
Mean...	0·19	0·14	0·21	9·99	0·19	0·17	0·21	9·48	20·58	0·5	S.53°E.		N.W.O.	N.W.O.
January 1938....	0·23	0·22	0·27	9·23	0·17	0·14	0·16	8·10	18·52	1·2	S.66°E.	11·0	S.81°W.	17·6
February —	0·18	0·11	0·14	7·56	0·18	0·13	0·18	7·55	16·03	0·04	S.52°W.	3·0	N.12°W.	19·1
March —	0·17	0·18	0·33	7·88	0·08	0·07	0·09	6·24	15·04	1·8	S.67°E.	8·2	S.69°W.	10·5
April —	0·16	0·14	0·14	7·48	0·21	0·15	0·18	7·00	15·46	0·5	S.47°E.	9·2	N.18°W.	13·0
May —	0·15	0·14	0·16	8·19	0·16	0·17	0·17	8·10	17·24	0·1	S.29°E.	1·9	N.24°E.	12·9
June —	0·12	0·10	0·15	6·80	0·08	0·07	0·08	6·25	13·65	0·6	S.67°E.	7·2	S.66°W.	10·3
July —	0·12	0·12	0·18	11·55	0·12	0·10	0·12	10·98	23·29	0·6	S.61°E.	4·9	S.51°W.	8·3
August —	0·17	0·13	0·17	12·20	0·23	0·20	0·24	11·45	24·79	0·8	S.44°E.	3·2	N.50°W.	9·2
September —	0·13	0·11	0·15	9·49	0·16	0·12	0·14	8·73	19·03	0·8	S.54°E.	2·0	S.57°W.	8·4
October —	0·15	0·14	0·19	8·61	0·06	0·06	0·07	7·78	17·06	0·9	S.71°E.	12·5	S.65°W.	16·7
November —	0·10	0·09	0·12	7·90	0·06	0·05	0·07	6·82	15·21	1·1	S.62°E.	12·9	S.54°W.	15·6
December —	0·15	0·13	0·17	8·34	0·17	0·14	0·16	7·86	17·12	0·5	S.54°E.	2·9	S. 1°E.	17·1
Mean...	0·15	0·13	0·18	8·77	0·14	0·12	0·14	8·07	17·70	0·7	S.60°E.		N.W.O.	N.W.O.
January 1939....	0·19	0·20	0·22	10·30	0·17	0·19	0·21	9·73	21·21	0·6	S.60°E.	2·7	S.54°W.	17·3
February —	0·27	0·28	0·34	11·36	0·13	0·11	0·14	10·80	23·43	0·7	Due E.	9·5	S.54°W.	13·1

No account is taken of earlier work done with other instruments. A starting-point had to be chosen, and the time of commencement of the use of the Vertical Log is the best one which suggests itself for a variety of reasons. Identical data will presumably go on coming in for all future years, and the results are just as acceptable for times of very wild weather as for times of calm. This claim could not be advanced with complete confidence for long-continued earlier series of observations made with another instrument.

A few explanatory remarks concerning the tables presented are necessary, but they do not apply to the Dutch data. Entries under "Residual Current" are to be read as sea-miles *per* lunar day towards true directions. The entries under "Residual Wind" represent miles *per* hour from true directions, and they result from computing the vector average of some 240 observations of wind made aboard the lightvessel concerned. The basic observations were personal estimates of direction and strength (Beaufort Scale) made eight times each day as a routine service duty incumbent upon the Master. A column has been added to accommodate information regarding actual wind speed. Clearly, the value for Residual Wind does not of necessity reveal anything as to what strengths of wind actually blew:—the same

Royal Sovereign Lightvessel.

Month and Year	Mileage Run (Daily Averages) of the Tidal Streams towards stated Octants of the Compass									Residual Current		Residual Wind		Average Wind Strength
	NNW.-NNE.	NNE.-ENE.	ENE.-ESE.	ESE.-SSE.	SSE.-SSW.	SSW.-WSW.	WSW.-WNW.	WNW.-NNW.	All					
	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.						
July 1936....	0·19	7·39	3·02	0·27	0·60	2·76	2·63	0·11	16·97	4·7	N.43°E.	11·8	S.43°W.	15·0
August —	0·02	4·53	5·87	0·16	0·03	5·42	3·51	0·02	19·56	2·0	S.79°E.	3·8	S.75°W.	9·8
September —	0·01	1·46	5·71	0·26	0·28	2·61	3·07	0·10	13·50	2·3	S.70°E.	1·7	S.78°W.	11·8
October —	—	0·84	6·04	0·23	0·34	4·89	1·52	0·02	13·88	3·8	S.39°E.	5·4	N.76°W.	16·2
November —	—	1·85	8·61	0·01	0·14	6·49	1·64	—	18·74	5·1	S.58°E.	6·0	S.81°W.	18·1
December —	—	0·58	8·84	—	—	7·34	0·26	—	17·02	6·1	S.50°E.	11·8	S.57°W.	18·1
Mean...	0·04	2·78	6·35	0·16	0·23	4·92	2·10	0·04	16·62	3·3	S.69°E.		N.W.O.	N.W.O.
January 1937....	—	0·06	10·50	—	—	7·09	0·06	—	17·71	7·4	S.58°E.	9·4	S.16°W.	19·4
February —	—	0·09	10·71	—	—	7·39	—	—	18·19	7·6	S.58°E.	12·6	S.70°W.	20·3
March —	—	0·13	9·25	0·10	0·01	9·21	0·01	—	18·71	7·1	S.35°E.	1·5	S.89°E.	16·2
April —			11·24			8·57			19·81	8·0	S.52°E.	2·5	S.61°W.	11·4
May —			10·75			8·81			19·56	7·7	S.47°E.	1·2	N.48°E.	8·4
June —			10·56			8·71			19·27	7·6	S.47°E.	3·1	S.63°W.	7·6
July —			8·72			6·88			15·60	6·2	S.49°E.	6·6	S.61°W.	11·8
August —			6·57			5·27			11·84	4·7	S.48°E.	1·3	N.56°W.	8·7
September —			10·01			8·40			18·41	7·2	S.45°E.	4·0	S.80°W.	11·3
October —			8·71			8·60			17·31	6·6	S.34°E.	2·1	N.77°E.	12·4
November —			8·77			9·08			17·85	6·8	S.31°E.	10·4	Due E.	10·4
December —			9·03			7·47			16·50	6·5	S.47°E.	0·3	N. 1°E.	15·5
Mean...	—	0·02	9·57	0·01	0·00	7·96	0·01	—	17·57	6·9	S.46°E.		N.W.O.	N.W.O.
January 1938....			9·93			6·80			16·73	7·0	S.58°E.	15·0	S.60°W.	21·2
February —			10·08			9·25			19·33	7·4	S.39°E.	1·8	N.51°E.	19·1
March —			9·03			8·42			17·45	6·7	S.38°E.	4·2	S.60°W.	8·2
April —			8·90			9·33			18·23	7·0	S.30°E.	5·5	N.12°E.	11·1
May —			10·14			9·01			19·15	7·4	S.42°E.	0·9	N.76°W.	11·1
June —			11·04			8·08			19·12	7·8	S.54°E.	9·3	S.55°W.	11·9
July —			11·48			7·91			19·39	8·1	S.57°E.	8·7	S.53°W.	11·1
August —			9·62			8·16			17·78	6·9	S.45°E.	2·4	S.59°W.	9·1
September —			7·73			5·64			13·37	5·5	S.54°E.	1·6	S.30°W.	8·9
October —			9·65			5·75			15·40	6·9	S.65°E.	12·2	S.57°W.	18·4
November —....			8·50			5·29			13·79	6·1	S.63°E.	14·5	S.46°W.	18·7
December —			7·17			5·59			12·76	5·1	S.50°E.	3·2	S.18°W.	18·2
Mean...			9·44			7·44			16·88	6·7	S.49°E.		N.W.O.	N.W.O.
January 1939....			7·76			5·54			13·30	5·5	S.55°E.	9·9	S.28°W.	19·3
February —			7·18			4·99			12·17	5·1	S.57°E.	8·3	S.51°W.	13·4
March —														

entry could result from (1) there having been nothing but a gentle wind blowing all the time from one direction, or (2) strong winds blowing first from one direction and then from the opposite direction or (3) winds of varying strength blowing from all points of the compass during the month. In the column in question, the entries show what was the average speed in miles *per* hour of all the winds recorded without reference to direction. There was however, a conversion from Beaufort numbers to miles *per* hour carried out first.

For whole years no average values for entry in the two wind columns were computed. The symbols "N.W.O." stand for "Not Worked Out", and "N.A." for "Not Available".

As to water movements:—the entries under N., N.E., ... and so on, give, in the form of daily averages, what mileage run of the streams there was towards the octants indicated. All directions within the octants have been arbitrarily referred to the middle ones in the computation of "Residual Current". The presentation of the data in the form adopted, is to

Sandettié Lightvessel.
(Observations made during Winter only.)

Month and Year	Mileage Run (Daily Averages) of the Tidal Streams towards stated Octants of the Compass									Residual Current		Residual Wind	Average Wind Strength
	NNW. NNE. N.	NNE. ENE. NE.	ENE. ESE. E.	ESE. SSE. S.E.	SSE. SSW. S.	SSW. WSW. S.W.	WSW. WNW. W.	WNW. NNW. N.W.	All				
December 1935....	0·14	12·57	0·08	0·20	6·34	5·68	0·03	0·01	25·05	5·3	S.84°E.	N. A.	N. A.
January 1936....	0·12	13·42	0·07	0·00	0·21	10·34	0·00	0·00	24·16	3·1	N.37°E.	—	—
February —	0·32	10·83	0·01	—	0·12	9·51	0·00	—	20·79	1·5	N.30°E.	—	—
Mean for Winter 1935/36	0·19	12·27	0·05	0·07	2·22	8·51	0·01	0·00	23·32	2·8	N.68°E.	—	—
December 1936....	0·12	13·25	0·40	0·03	0·36	11·66	0·23	—	26·05	1·6	N.47°E.	—	—
January 1937....	0·13	15·56	0·22	0·30	0·07	8·73	0·79	0·10	25·90	6·5	N.33°E.	—	—
February —	0·06	13·57	0·05	0·04	0·42	10·39	0·20	0·01	24·74	2·8	N.39°E.	—	—
Mean for Winter 1936/37	0·10	14·13	0·22	0·12	0·28	10·26	0·41	0·04	25·56	3·6	N.36°E.	—	—
December 1937....	0·03	11·97	0·29	0·18	0·13	12·17	0·09	0·10	24·96	0·3	S.32°E.	—	—
January 1938....	0·00	12·96	0·09	0·19	0·04	12·54	0·02	0·00	25·84	0·5	N.66°E.	—	—
February —	0·05	12·09	0·15	0·02	0·38	13·39	0·07	0·00	26·15	1·5	S.23°W.	—	—
Mean for Winter 1937/38	0·03	12·34	0·18	0·13	0·18	12·70	0·06	0·03	25·65	0·5	S. 3°E.	—	—
December 1938....	0·05	12·63	0·03	—	0·13	12·75	0·13	—	25·72	0·2	S.38°W.	—	—
January 1939....	—	13·53	0·07	0·01	0·09	11·25	0·06	—	25·01	2·2	N.37°E.	—	—
February —	—	14·39	..	..	..	12·86	..	—	27·25	1·5	N.35°E.	—	—
Mean for Winter 1938/39	0·02	13·52	0·03	0·00	0·07	12·29	0·06	—	25·99	1·2	N.36°E.	—	—

facilitate easy averaging over groupings of months in which individual readers may be particularly interested.

The Dutch data are set down in a manner which is sufficiently self-explanatory and thanks are due to Dr. VAN VEEN for kindly supplying them and permitting them to be published here. At the time of writing, no data from the Danish Horns Rev lightship were available. It is hoped that when the next report is published, it will be possible to present records from a Belgian lightvessel as well. Such extra data would be very useful indeed as will be realised from what is said below.

Results from Vertical Log Observations aboard Dutch Lightships.

Note on Units.

The data received from Dr. VAN VEEN were expressed in kilometres *per* tide. It has been considered that for presentation here, there is no need to go to the trouble of converting them into seamiles *per* lunar day which are the units used in the English tabulations. His values need to be increased by 8 *per cent.* only to convert them into the English units. In the Dutch tables the entries under "Flood Run", under "Ebb Run" and under "Drift", are to be read as kilometres *per* tide. The expression "Drift" is equivalent to our "Residual Current", and the values for run of the streams are given for the convenience of averaging the results into groups of months.

Abbreviations. The directions of streams and drift are expressed clockwise round the compass from 0° to 360°. They were thus expressed when the data were received and they are true directions.

Comments.

The recommendation of the Hydrographical Committee asked that the writer should comment on the results set down in the annual reports it called for. It may be possible in future years to supply such comments, but in the case of this first yearly report, there has been a rush to work up the lightship records in time to get them away by the date given for despatch of the report to Copenhagen. It was considered necessary to wait until the records for February 1939 were to hand so that the spawning season could be covered. Attention is drawn to the data relating to the various winters embraced by the tables, and the hope is entertained that they will

Galloper Lightvessel.
(Observations made during Winter only.)

Month and Year	Mileage Run (Daily Averages) of the Tidal Streams towards stated Octants of the Compass									Residual Current		Residual Wind		Average Wind Strength
	NNW. NNE. N.	NNE. ENE. N.E.	ENE. ESE. E.	ESE. SSE. S.E.	SSE. SSW. S.	SSW. WSW. S.W.	WSW. WNW. W.	WNW. NNW. N.W.	All					
December 1935....	1·41	9·61	0·46	0·00	0·07	10·92	1·04	0·33	23·84	1·9	N.80°W.	N. A.		N. A.
January 1936....	0·02	11·36	0·08	0·10	0·20	12·53	0·11	—	24·40	1·3	S.26°W.	—		—
February —	—	10·65	0·03	0·32	0·37	10·95	0·32	—	22·64	0·9	S. 9°W.	—		—
Mean for Winter 1935/36	0·48	10·54	0·19	0·14	0·21	11·47	0·49	0·11	23·63	1·0	S.56°W.	—		—
December 1936....	0·59	10·23	0·11	0·09	0·44	11·27	0·49	0·01	23·23	1·2	S.49°W.	10·2	S.53°W.	18·9
January 1937....	0·19	9·60	0·15	0·24	0·59	13·19	0·22	0·02	24·20	3·9	S.28°W.	9·5	S. 4°E.	20·7
February —	0·09	10·40	0·01	0·07	0·18	12·94	0·20	0·03	23·92	2·7	S.36°W.	11·7	S.56°W.	21·0
Mean for Winter 1936/37	0·29	10·08	0·09	0·13	0·40	12·47	0·30	0·02	23·78	2·6	S.34°W.	N.W.O.		N.W.O.
December 1937....	0·16	10·90	0·09	0·04	0·32	10·87	0·11	0·12	22·61	0·1	S.27°W.	1·4	N.49°W.	15·8
January 1938....	0·25	11·72	0·13	0·02	0·15	10·46	0·14	0·15	23·02	1·3	N.26°E.	11·8	S.68°W.	19·2
February —	0·18	9·98	0·09	0·09	0·15	11·88	0·18	0·28	22·83	2·0	S.43°W.	3·3	N. 1°E.	21·0
Mean for Winter 1937/38	0·20	10·87	0·10	0·05	0·21	11·07	0·14	0·18	22·82	0·3	S.68°W.	N.W.O.		N.W.O.
December 1938....	0·23	11·92	0·20	0·04	0·07	10·63	0·19	0·18	23·46	1·4	N.25°E.	6·3	S. 1°W.	20·6
January 1939....	0·11	12·87	0·18	0·08	0·03	11·40	0·11	0·21	24·99	1·6	N.30°E.	7·1	S.28°W.	20·7
February —	0·10	12·56	0·10	0·01	0·10	11·66	0·08	0·08	24·69	0·9	N.31°E.	9·9	S.47°W.	15·8
Mean for Winter 1938/39	0·15	12·45	0·16	0·04	0·07	11·23	0·13	0·16	24·39	1·3	N.28°E.	N.W.O.		N.W.O.

be of use to those whose concern it is to study the fortunes of plaice and herrings. For the rest, it is held to be a matter for satisfaction that the data set down above are now in a convenient published form which will provide a background against which to discuss future findings. It should be remarked that averages for certain Winters at the Galloper and Sandettié lightvessels were given in earlier papers. Where small differences exist between those and the values now presented, it is because the constituent data for sub-periods have been rounded off to a slightly different extent.

It is expected that future additions to the present body of data (with relevant discussion) will appear in the new annual expected to be issued by the Council.

A remark which is called for, is to the effect that whilst observations aboard the Varne show what flow of water takes place through the Straits of Dover, they do not permit easy assumptions to be directly made concerning the direction of onward flow of that water up the Southern Bight. Clearly, one needs to refer to the results from the other lightships to fill in the picture at all. Winds from the S.E. quadrant *may* be associated with a Varne flow little different from that taking place under S.W.'ly wind conditions. The circulation in the Southern Bight would be very different in the two cases, and that is why it is very desirable to have at one's disposal records from the Sandettié all the year round.

It is clear that the projected observations aboard the West Hinder lightvessel under the sponsorship of Professor GIBSON, would be of very great use indeed.

Maas Lightvessel.

Year	Month	Flood Run	Flood Direction	Ebb Run	Ebb Direction	Drift	Drift Direction
1937	23/6—1/8	10·3	52½°	8·3	238½°	2·2	29°
—	August	10·0	,,	8·8	,,	1·7	21°
—	September	8·0	,,	6·8	,,	1·4	29°
—	October	7·6	,,	5·9	,,	1·7	36°
—	November	9·0	,,	8·0	,,	1·2	18°
—	December	9·6	,,	6·9	,,	2·7	42°
1938	January	8·1	61°	6·1	239°	2·0	65°
—	February	7·3	49°	7·8	242°	1·8	311°
—	March	7·4	54°	6·8	239°	0·8	10°
—	April	7·2	63°	8·7	235°	1·9	201°
—	May	7·9	56°	7·2	239°	0·8	27°
—	June	8·3	58°	6·2	240°	2·2	55°
—	July	8·0	58°	6·8	240°	1·2	46°
—	August	8·9	54°	8·5	238°	0·8	350°
—	September	7·7	51°	5·9	242°	2·2	19°
—	October	9·0	49°	8·2	240°	1·6	353°
—	November	10·2	52°	7·7	244°	3·2	21°
—	December	9·9	43°	8·5	249°	4·4	344°
1939	January	10·4	53°	8·2	250°	3·4	11°
—	February	8·8	52°	7·4	246°	2·5	4°
—	March						

Terschelling Bank Lightvessel.

Year	Month	Flood Run	Flood Direction	Ebb Run	Ebb Direction	Drift	Drift Direction
1938	10/6—1/7	12·4	59°	6·6	257°	6·4	40°
—	July	12·2	49°	5·3	255°	7·8	31°
—	August	10·4	58°	7·7	252°	3·5	25°
—	September	9·8	55°	6·5	251°	4·0	28°
—	October	11·6	59°	4·3	260°	7·7	48°
—	November	10·8	52°	4·0	261°	7·6	37°
—	December	10·3	50°	6·3	269°	6·7	13°
1939	January	10·9	48°	5·5	255°	6·6	25°
—	February	7·7	54°	4·7	259°	4·0	24°
—	March						

North Hinder Lightvessel.

Year	Month	Flood Run	Flood Direction	Ebb Run	Ebb Direction	Drift	Drift Direction
1938	August	12·9	54°	9·0	220°	4·7	81°
—	September	10·3	53°	8·0	226°	2·5	75°
—	October	10·4	53°	5·7	223°	4·9	64°
—	November	10·4	56°	6·4	240°	4·0	49°
—	December	8·5	52°	5·8	232°	2·7	51°
1939	January	8·4	55°	4·9	236°	3·5	52°
—	February	7·4	52°	5·1	234°	2·3	48°
—	March						

Haaks Lightvessel.

Year	Month	Flood Run	Flood Direction	Ebb Run	Ebb Direction	Drift	Drift Direction
1938	September	7·0	26°	7·2	216°	1·3	292°
—	October.....	10·8	39°	5·6	206°	5·6	53°
—	November.....	8·2	32°	4·6	202°	3·7	44°
—	December.....	7·3	21°	5·9	220°	2·6	334°
1939	January	8·0	23°	5·2	217°	3·2	0°
—	February	7·7	22°	5·4	210°	2·4	6°
—	March						

Addendum

Results from the Horns Rev Lightship have been kindly forwarded by Dr. Å VEDEL TÅNING since the above article was written. For certain reasons the work was not in train during December, but the results for January and February, 1939, were as follows: —

January 1939:— 3·9 sea-miles *per* lunar day towards NNW.

February 1939:— 3·7 sea-miles *per* lunar day towards NNW.