

METEOROLOGICAL OFFICE

BRITISH CLIMATOLOGICAL BRANCH MEMORANDA, No.7

Summaries of observations of fog duration
at British ports.

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Introduction

Information on the incidence of fog at British ports was requested by the Marine Safety Division of the Ministry of Transport in 1948 in connection with the proposed installation of radar equipment. Existing information proved to be insufficient to give a comprehensive outline of the duration of fog occurring in river entrances and harbours, and the possibility of obtaining standard observations was considered.

The cooperation of the local authorities was sought by the Marine Superintendent of the Meteorological Office through Port Meteorological Officers and arrangements were made for a trial of the proposed scheme at selected stations. The first observations were made in September 1949 and additional observation points were introduced from time to time. Observations had been made at 26 points when the scheme ended in March 1956.

A considerable amount of information has been collected during this period which has already proved of value in answering enquiries from shipping and port authorities. Thanks are due to the many voluntary observers who have undertaken this work in addition to their normal duties in order to contribute to the safety of shipping.

Observational procedure and information obtained

In order to simplify the observations and to ensure, as far as possible, that the results were available in standard form suitable for comparison with existing records, observations were made of the duration in hours and minutes of periods during which the visibility from the observing point was less than (a) 440 yards and (b) 1100 yards; these distances are the lower limits of the standard visibilities E and F used for climatological observations and the further distance defines the limit of visibility below which fog is considered to have occurred.

Objects at approximately the standard distances from the observing point were selected as aids to the estimation of visibility; where suitable objects were available little difficulty was experienced when making the observations by day; at night, lights on or near the objects were used in making the estimates.

For the purpose of this summary only stations at which a continuous watch was kept throughout the 24 hours have been included. Provision was made for the observer to indicate the degree of accuracy of the times reported, i.e. to within a quarter of an hour, to about half an hour or over half an hour. Totals and durations in this summary have been rounded off to the nearest hour.

A map showing the positions of the stations is given in Fig.1.

Limitations of the data obtained

At three of the stations whose figures have been summarised, Greenwich, Calshot and Newport, the distances of objects E departed appreciably from the standard limits and it should be borne in mind when examining the figures for these stations that they are not comparable with the majority.

Estimates of visibility made at night may have differed from the standards, owing to the varying intensities of the lights in use and variations in the general degree of illumination caused by moonlight or artificial lighting.

For statistical purposes object F was considered to be obscured whenever object E was not visible, though where the visibility objects were situated in different directions when viewed from the observing point and visibility was variable this was not always the case.

Unbroken periods of fog which extended from the last days of one month to the first days of the following month were considered to be broken, each month being credited with one period ending or beginning at midnight on the last day of the month. Where, however, the longest periods experienced during the year are given, the extremes refer to periods without any breaks at the end of the months.

Summaries of observations

Table I(a) gives a summary of the annual totals and longest periods in hours of visibilities less than distance E for each station.

Table I(b) gives similar information for distance F.

It will be noted that there was considerable variation from year to year. The period under discussion included the exceptionally foggy winter of 1952-53; notable occurrences were the dangerous and persistent fog in London and the Home Counties from December 5 to 9, 1952, and the widespread fog in England, Wales and Ireland during the first six days of March, 1953. These exceptional periods of fog have inflated the totals and longest durations at certain stations during the years 1952 and 1953.

In Table I(a) the largest annual totals occurred at Woolwich and Calshot in 1953, but it should be noted that the objects were at distances of 500 and 600 yards respectively. Restricting the comparison to stations with object E at 440 + 10 yards the largest values were 288 hours at Tilbury and 269 hours at both Walton Bay and Cardiff, all in 1953, while the smallest totals were at Swansea with 9 hours and at Cardiff with 12 hours, both in 1954.

In Table I(b), considering stations with object F at 1100 yards, the largest totals were 633 hours at Calshot in 1953 and 545 hours at Cardiff in 1951, while the lowest values were recorded at Swansea and Cardiff in 1954 with 21 and 54 hours respectively.

Table II summarises the number of spells each year when visibilities were below both limits E and F for durations of 5 minutes or more.

It will be noted that, in general, most of the stations experienced the greatest number of periods in the year 1953 and the fewest in 1954, and it is possible to estimate the number of spells which might be expected at a particular station in the course of a "normal" year.

Table III is a specimen frequency table for Woolwich. All periods of visibility less than (a) 500 yards and (b) 1000 yards exceeding 5 minutes duration have been summarised to show the frequency of occurrence of spells of various lengths, from less than 1 hour to more than 10 hours. Means for the six years 1950-1955 have been given, and indicate that when visibility at Woolwich falls below 500 yards the probability of it remaining below that limit for more than 3 hours is only 1 in 2, while on one occasion in every four the visibility will again exceed 500 yards before 1 hour has elapsed. On one occasion in eight the period of reduced visibility may exceed 10 hours. Similar inferences may be drawn from the values relating to the limit of 1000 yards.

Similar frequency tables for other stations have not been prepared since the period covered is limited.

Tables IV (a) and (b) are specimen summaries giving monthly and annual totals and longest periods for Woolwich and Tilbury. Means for the four years 1952-1955 show that the distribution of fog throughout the year is much as might be expected, the six months April to September being comparatively free from fog while the most frequent and persistent periods occur from October to March. It will be seen again, however, that the exceptional fogs of December 1952 and January and March 1953 have distorted the figures during the period under consideration.

Annual totals in Tables IV (a) and (b) are the sums of the rounded off monthly totals and in some cases they differ from the more precise totals in Tables I(a) and (b).

Similar information is readily available for the other stations for the periods indicated in Tables I(a) and (b), but such information is not included in order to keep this memorandum within reasonable limits.

Figs II(a) and (b) present graphically part of the data for Woolwich and Tilbury given in Tables IV(a) and (b). Fig. II(a) shows the monthly distribution of periods when object E was obscured at the two stations on the Thames with records from January 1952 to December 1955. Fig. II(b) gives the data for periods when object F was obscured.

Figs. III(a) and (b) are similar graphs for the group of stations on the coast of South Wales; Barry, Cardiff, Newport and Swansea.

Further graphs for the groups of stations in the Liverpool, Southampton, Bristol and Glasgow areas could be prepared from the information available, and the Figs. II(a) and (b) and Figs. III(a) and (b) are given to illustrate a manner in which the data may be presented.

March, 1957

Table I (a) Total number of hours of fog (Object E obscured)

Longest period each year in brackets

Station	Object distance (yd.)	1950	1951	1952	1953	1954	1955	Mean 1952-55
Woolwich	500	123 (25)	198 (32)	239 (65)	374 (33)	92 (15)	123 (14)	207
Greenwich	320		155 (31)					-
Surrey Docks	460					85 (15)		-
Tilbury	433		191 (34)	232 (57)	288 (23)	56 (15)	109 (16)	171
Ganvey Island	440		155 (27)	232 (70)				-
Liverpool	400			58 (9)	93 (18)	57 (27)	65 (21)	68
Birkenhead	500			95 (17)	196 (35)	95 (28)	63 (15)	112
Eastham Locks	440			129 (18)	217 (35)	111 (29)	67 (11)	131
Heysham	440			63 (8)	150 (24)	14 (3)	29 (4)	64
Southampton	445		98 (13)	108 (12)	225 (15)	84 (11)	77 (12)	123
Calshot	600			212 (11)	454 (20)	106 (16)	111 (17)	221
Avonmouth	433			92 (16)	253 (27)			-
Walton Bay	440				269 (35)			-
Barry	440		60 (15)	31 (9)	204 (33)	29 (10)	56 (12)	80
Cardiff	440		249 (21)	92 (9)	269 (129)	12 (6)	24 (13)	99
Newport	530		113 (30)	56 (9)	251 (41)	19 (8)	63 (23)	97
Swansea	440		39 (13)	11 (3)	116 (13)	9 (3)	19 (3)	39
Glasgow	417				138 (16)	54 (29)		-
Govan	440				220 (19)	109 (27)	103 (15)	-
Greenock	485						38 (13)	-

Table I (b) Total number of hours of fog (Object F obscured)

Woolwich	1000	186 (26)	281 (34)	354 (106)	564 (37)	164 (21)	227 (19)	327
Greenwich	1200		408 (38)					-
Surrey Docks	1050					186 (21)		-
Tilbury	1066		237 (34)	318 (104)	483 (42)	113 (17)	149 (16)	266
Ganvey Island	1100		293 (32)	363 (91)				-
Liverpool	1200			524 (28)	599 (42)	426 (27)	273 (24)	455
Birkenhead	1160			219 (22)	333 (37)	169 (28)	197 (44)	229
Eastham Locks	1300			327 (29)	527 (46)	227 (40)	175 (16)	314
Heysham	1133			183 (13)	352 (25)	120 (25)	114 (13)	192
Southampton	1035		152 (16)	169 (13)	386 (25)	155 (14)	133 (19)	211
Calshot	1100			274 (11)	633 (38)	153 (16)	173 (25)	308
Avonmouth	1213			143 (16)	402 (69)			-
Walton Bay	1100			117 (12)	412 (92)			-
Barry	1100		119 (17)	134 (13)	352 (33)	103 (16)	120 (13)	177
Cardiff	1100		545 (22)	433 (21)	413 (129)	54 (17)	129 (45)	257
Newport	1310, 1140 from Oct. 1954		132 (30)	90 (9)	259 (42)	22 (8)	71 (23)	111
Swansea	1100		67 (13)	27 (7)	169 (16)	21 (6)	44 (5)	65
Glasgow	1270				182 (21)	75 (29)		-
Govan	1048				316 (19)	142 (27)	197 (15)	-
Greenock	1100						58 (13)	-

Table II. Number of spells each year when visibilities were below the limits for durations of 5 min. or more.

Station	Object E obscured						Object F obscured					
	1950	1951	1952	1953	1954	1955	1950	1951	1952	1953	1954	1955
Woolwich	30	39	38	64	22	32	42	52	52	90	33	47
Greenwich		23						65				
Surrey Docks					19						31	
Tilbury		43	34	53	14	24		54	42	71	25	32
Canvey Island		38	37					55	49			
Liverpool			17	25	7	13			109	123	68	59
Birkenhead			27	46	14	20			71	81	44	63
Eastham Locks			28	45	16	20			58	66	37	39
Heysham			31	31	15	19			63	70	34	49
Southampton		32	35	45	30	35		40	49	73	37	44
Calshot			66	69	27	30			75	80	34	42
Avormouth			30	40					34	57		
Walton Bay				51					38	69		
Barry		13	11	32	7	16		27	28	51	19	23
Cardiff		52	22	17	4	4		88	86	36	11	12
Newport		21	14	28	4	8		23	20	27	6	9
Swansea		12	5	25	3	7		18	8	30	6	14
Glasgow				20	7					27	12	
Govan				43	20	24				52	25	33
Greenock						11						16

Table III. Woolwich (Royal Dockyard) Frequency of periods of fog.

(a) Visibility less than 500 yd.

Period \ Year	1950	1951	1952	1953	1954	1955	Mean 1950-55
Up to 1 hour	9	9	10	10	4	9	9
> 1 hr. up to 2 hr.	8	6	2	8	6	8	6
> 2 hr. " " 3 hr.	3	4	6	12	2	1	5
> 3 hr. " " 4 hr.	2	2	4	5	2	2	3
> 4 hr. " " 5 hr.	3	1	5	5	2	1	3
> 5 hr. " " 6 hr.	0	3	1	5	2	1	2
> 6 hr. " " 7 hr.	0	2	2	1	1	5	2
> 7 hr. " " 8 hr.	0	5	2	3	0	0	2
> 8 hr. " " 9 hr.	1	1	0	2	0	2	1
> 9 hr. " " 10 hr.	1	1	1	2	0	0	1
> 10 hr.	3	5	5	11	3	3	5
Total	30	39	38	64	22	32	39
Longest (hours)	25	32	65	33	15	14	-

(b) Visibility less than 1000 yd.

Period \ Year	1950	1951	1952	1953	1954	1955	Mean 1950-55
Up to 1 hour	7	5	8	6	3	7	6
> 1 hr. up to 2 hr.	11	11	8	14	7	14	11
> 2 hr. " " 3 hr.	6	9	9	12	4	5	7
> 3 hr. " " 4 hr.	4	7	6	15	4	4	7
> 4 hr. " " 5 hr.	3	0	7	6	3	0	3
> 5 hr. " " 6 hr.	3	3	1	5	4	3	3
> 6 hr. " " 7 hr.	0	3	2	6	2	3	3
> 7 hr. " " 8 hr.	2	6	1	2	2	2	3
> 8 hr. " " 9 hr.	1	2	1	4	0	2	2
> 9 hr. " " 10 hr.	1	2	1	7	0	1	2
> 10 hr.	4	4	8	13	4	6	7
Total	42	52	52	90	33	47	54
Longest (hours)	26	34	106	37	21	19	-

Table IV (a). Woolwich (Royal Dockyard) Number of hours and longest period during which visibility was less than (a) 500 yd. (b) 1000 yd.

(a)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year*
1950	28 (14)	7 (4)	19 (10)	- (-)	4 (3)	- (-)	- (-)	- (-)	- (-)	- (-)	53 (25)	11 (4)	122 (25)
1951	34 (32)	11 (6)	11 (8)	8 (6)	4 (4)	- (-)	- (-)	- (-)	9 (9)	75 (14)	5 (3)	41 (17)	198 (32)
1952	12 (4)	48 (15)	20 (5)	- (-)	1 (1)	- (-)	- (-)	- (-)	- (-)	15 (7)	23 (15)	121 (65)	240 (65)
1953	103 (33)	17 (8)	110 (19)	4 (4)	2 (2)	- (-)	- (-)	1 (1)	18 (9)	21 (11)	33 (19)	64 (26)	373 (33)
1954	14 (11)	12 (6)	- (-)	1 (1)	- (-)	- (-)	- (-)	8 (5)	3 (3)	5 (5)	24 (13)	25 (15)	92 (15)
1955	31 (8)	5 (2)	- (-)	2 (2)	- (-)	5 (4)	7 (7)	4 (1)	- (-)	28 (11)	17 (13)	24 (14)	123 (14)
Mean 1952-55	40	21	3	2	1	1	2	3	5	17	24	59	208

(b)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year*
1950	52 (14)	8 (5)	25 (12)	2 (2)	8 (3)	- (-)	- (-)	- (-)	- (-)	4 (2)	62 (26)	25 (6)	186 (26)
1951	37 (33)	15 (6)	13 (8)	10 (7)	11 (7)	1 (1)	- (-)	- (-)	13 (10)	90 (14)	17 (5)	74 (34)	281 (34)
1952	15 (4)	92 (19)	30 (13)	- (-)	3 (2)	- (-)	- (-)	- (-)	1 (1)	21 (7)	31 (16)	160 (106)	353 (106)
1953	163 (37)	47 (9)	137 (26)	6 (5)	5 (2)	- (-)	- (-)	2 (2)	20 (10)	46 (11)	52 (22)	86 (28)	564 (37)
1954	21 (12)	25 (8)	4 (2)	4 (3)	- (-)	- (-)	- (-)	9 (6)	3 (3)	10 (7)	53 (21)	35 (17)	164 (21)
1955	55 (14)	21 (18)	3 (3)	3 (2)	- (-)	9 (8)	7 (7)	7 (2)	1 (1)	42 (18)	31 (19)	48 (15)	227 (19)
Mean 1952-55	63	46	43	3	2	2	2	5	6	30	42	82	326

* extremes not limited by breaks at end of month

Table IV (b). Tilbury (Landing Stage) Number of hours and longest period during which visibility was less than (a) 433 yd. (b) 1066 yd.

(a)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year*
1951	35 (34)	10 (6)	10 (9)	7 (7)	5 (4)	1 (1)	-	-	13 (9)	77 (16)	4 (2)	31 (12)	193 (34)
1952	-	49 (15)	25 (11)	-	10 (6)	-	-	-	3 (3)	8 (4)	23 (11)	115 (57)	233 (57)
1953	64 (15)	6 (5)	109 (23)	5 (5)	8 (2)	-	-	2 (2)	17 (11)	13 (11)	17 (12)	47 (23)	288 (23)
1954	15 (13)	3 (3)	-	1 (1)	-	-	-	4 (3)	2 (2)	-	22 (15)	10 (10)	57 (15)
1955	17 (9)	-	-	2 (2)	-	4 (4)	10 (9)	8 (3)	3 (2)	28 (13)	24 (16)	13 (13)	109 (16)
Mean 1952-55	24	15	33	2	5	1	3	3	6	12	21	46	171

✓ 20 minutes

(b)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year*
1951	38 (34)	14 (8)	14 (9)	7 (7)	11 (8)	2 (2)	-	-	13 (9)	87 (16)	8 (5)	43 (12)	237 (34)
1952	-	73 (16)	28 (12)	2 (1)	13 (8)	-	-	-	4 (3)	12 (4)	34 (12)	152 (104)	318 (104)
1953	132 (36)	17 (9)	171 (42)	6 (6)	11 (3)	3 (3)	-	5 (4)	21 (11)	30 (12)	31 (18)	57 (29)	484 (42)
1954	16 (14)	24 (7)	6 (6)	1 (1)	-	-	-	12 (4)	4 (3)	-	39 (17)	11 (11)	113 (17)
1955	34 (13)	-	-	4 (3)	-	5 (5)	17 (9)	14 (4)	4 (3)	29 (13)	26 (16)	15 (14)	148 (16)
Mean 1952-55	45	29	51	3	6	2	4	8	8	18	33	59	266

* extremes not limited by breaks at end of month.



Fig.I Fog observing stations at British ports

Fig. II(a)

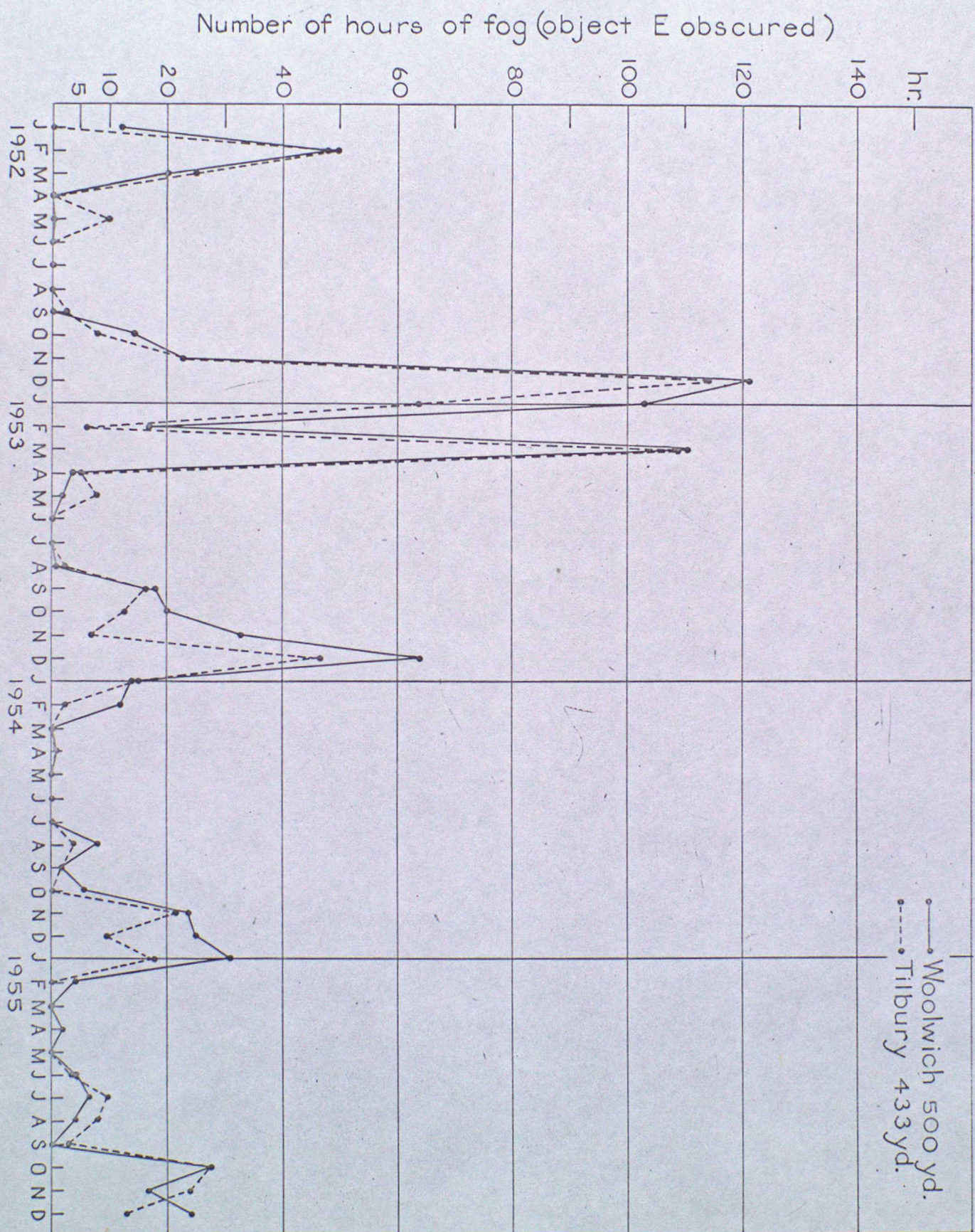


Fig. II(b)

Number of hours of fog (object F obscured)

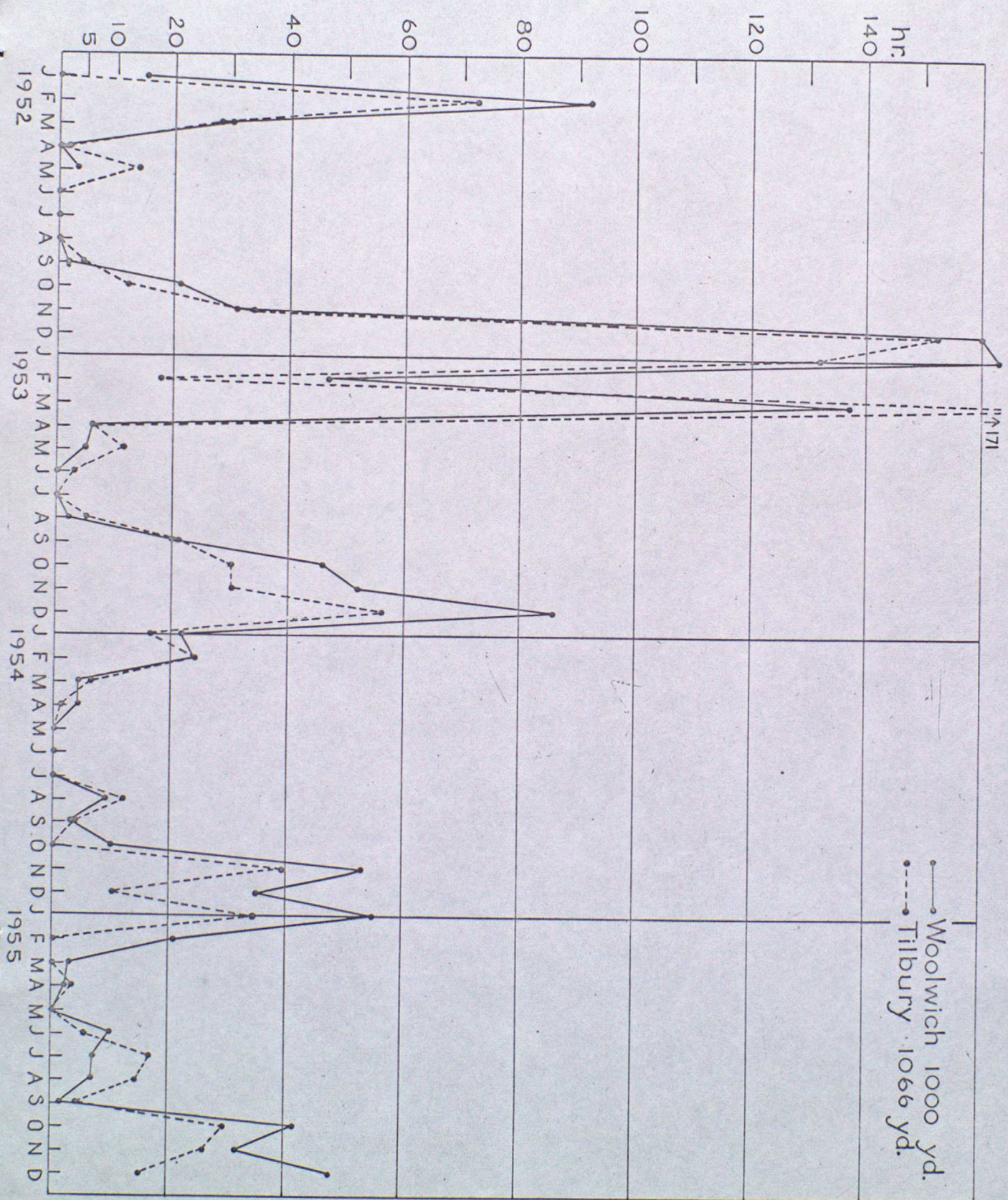


Fig. III (a)

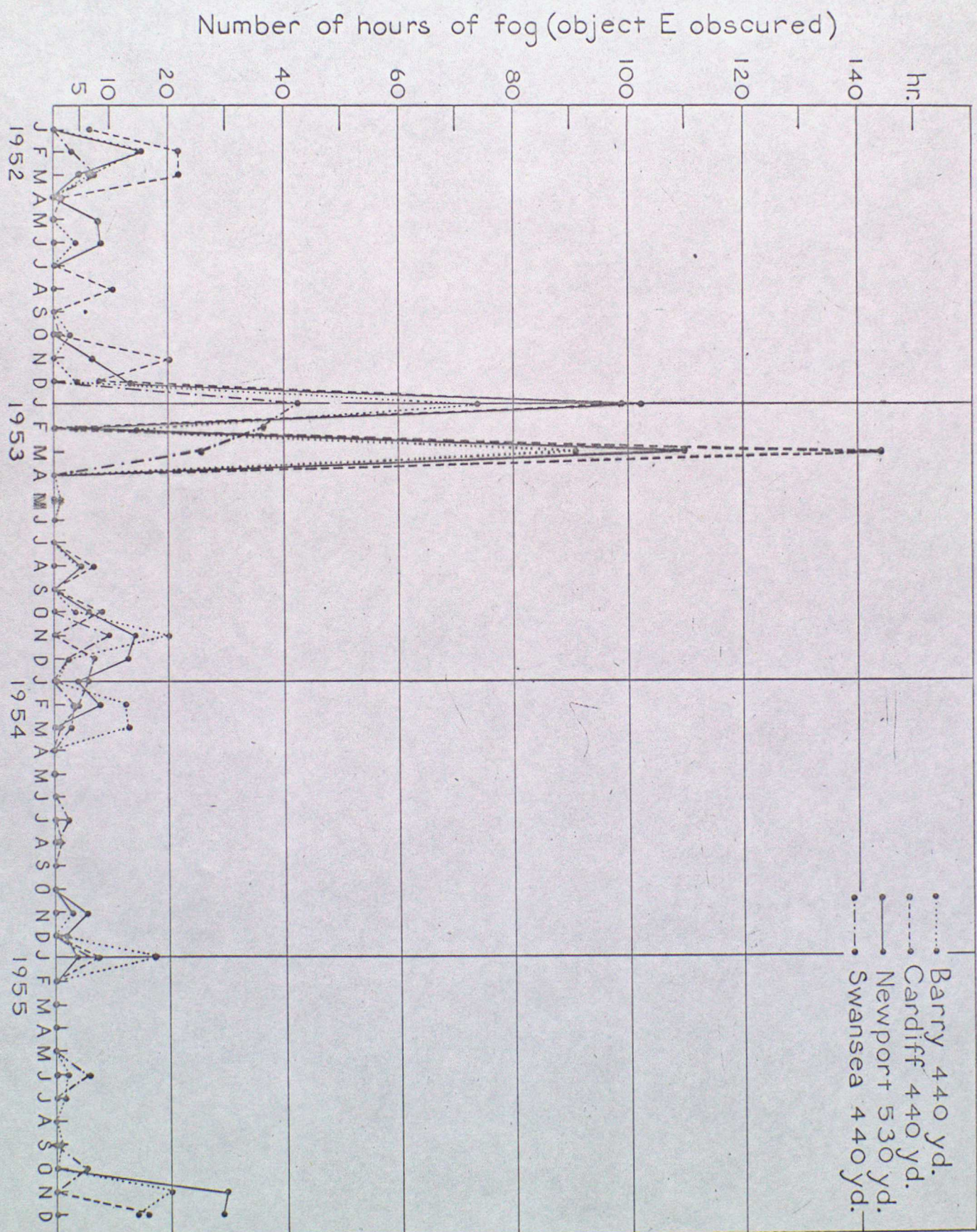


Fig.III(b)

Number of hours of fog (object F obscured)

