

Notes on Meteorological Observations at Plymouth.

By

H. N. Dickson, F.R.S.E.

THE meteorological observations at Plymouth Navigation School, carried on for a period of more than twenty-six years by Dr. J. Merrifield, ceased on his death in June last. It seemed desirable that Plymouth should not be without an observing station, and as the Association was undertaking other work of a similar nature it was decided to begin observations on the scale of a station of the second order.

Mr. W. V. Merrifield, into whose hands the instruments passed on his father's death, kindly offered to lend a set of thermometers and sunshine recorder. The barometer used by Dr. Merrifield is the property of the Meteorological Council, who have transferred the instrument temporarily to the hands of the Association until another instrument can be acquired.

The ground behind the Laboratory, being almost enclosed by the walls of the Citadel, was obviously unsuitable for the exposure of meteorological instruments. Application was accordingly made to the municipal authorities of Plymouth for permission to erect a thermometer screen and to expose a rain gauge on the enclosed ground behind the public lavatory on the Hoe. This permission was granted by the Hoe Committee, and an exceptionally good exposure has been obtained close to the Laboratory.

In order to make the observations as generally useful as possible, copies are regularly supplied to the following:—(1) The Meteorological Office, weekly and monthly Reports. (2) The Royal Meteorological Society, monthly Reports. (3) The Medical Officer of Health, fortnightly Reports. (4) Western Morning News, daily Report and monthly Summary.

The sheets are issued from the Laboratory with all corrections made, and summed and averaged. The following is a list of the elements observed and calculated:—Atmospheric pressure. Temperature: Dry bulb, Wet bulb, Maximum, Minimum, Dew-point. —Pressure of vapour—Relative humidity. Wind: Direction, Force

(Beaufort Scale). Cloud: Form, Amount (0—10). Rainfall. Sunshine. Ozone (0—10).

The barometer is of marine pattern (B. T. 59), reading to $\cdot 002$ in., and hangs in an unused room with a north light. The height of the cistern above mean sea level at Devonport Dockyard is 125.9 feet, as ascertained by levels from Ordnance datum mark, executed by Plymouth Borough Engineer. The reduction of observations to sea level is effected by tables specially supplied by the Meteorological Office.

The thermometers are exposed in a Stevenson screen of the usual pattern, open below. A complete duplicate set of thermometers is kept in readiness in case of accident. Observations are made with Negretti and Zambra's ozone tests, the papers being hung in the Stevenson screen.

The rain gauge is of Meteorological Office pattern, with circular rim 8 inches in diameter. Height of rim above ground 0.62 foot, above mean sea level 117.7 feet.

The Campbell-Stokes sunshine recorder is placed on the roof of the Laboratory, at the point where the eye observations of wind, cloud, and weather are made. The instrument fits into a frame mounted on an adjustable stage, so that it can be removed and replaced without further adjustment. The place of observation is in lat. $50^{\circ} 21' 49''$ N., long. $4^{\circ} 8' 21''$ W., as determined by measurements from the dial on the Breakwater, of which the position is accurately laid down on the chart.

The hours of observation are 9 a.m. and 9 p.m. local time, or 9 h. 16.5 m. Greenwich time. It was found impossible to take regular daily observations with greater frequency.

The ordinary routine work was begun on September 1st, and a table showing the means for the month is appended to these notes.

Mr. Merrifield has been kind enough to give me access to his father's meteorological records, and I hope to be able to discuss them fully in a future number of the Journal. In the meantime a few of the more obvious results may be of interest.

The position of the observing station was in lat. $50^{\circ} 22' 25''$ N., long. $4^{\circ} 7' 16.5''$ W. From the commencement of the observations the instruments were 90 feet above mean sea level up to July, 1873. They were then removed to a new position, cistern of barometer 69 feet above mean sea level; rain gauge 9 feet 2 inches above the ground. The hour of observation was 8 a.m. till 1887, when it was changed to 9 a.m.

Atmospheric Pressure.

The mean pressures, reduced to 32° F. and sea level (for the twenty-six years, 1865—1890), are as follows :

	Mean pressure, 8 a.m.	Monthly range.
January	29·956 inches	1·455 inch.
February	29·980 ”	1·277 ”
March	29·941 ”	1·258 ”
April	29·898 ”	1·094 ”
May	29·968 ”	0·898 ”
June	30·024 ”	0·778 ”
July	29·979 ”	0·762 ”
August	29·965 ”	0·761 ”
September	29·975 ”	0·927 ”
October	29·924 ”	1·171 ”
November	29·925 ”	1·257 ”
December	29·952 ”	1·277 ”
Means	29·957 ”	1·076 ”

The maximum pressure thus occurs in June, and the minimum in October and November. The month of greatest range is January ; that of least, August. The highest recorded reading, 30·952 inches, occurs in January, 1882 ; and the lowest, 28·418 inches, in December, 1876. The highest monthly mean, 30·347 inches, is that for January, 1880 ; and the lowest, 29·422 inches that for December, 1876. It should be noted that for the reductions to sea level the tables supplied by the Meteorological Office have been employed.

For purposes of comparison I have taken the means for the fifteen years, 1870—1884, and beside these are placed means for the same years from Falmouth Observatory, the last named being extracted from the “Challenger” Report on Atmospheric Circulation,* and reduced to sea level by means of the table given in ‘Instructions in the Use of Meteorological Instruments,’ issued by the Meteorological Office.

	Plymouth.	Falmouth.	Differences.
January	29·991	30·003	-·012
February	29·944	29·946	-·002
March	29·970	29·979	-·009
April	29·880	29·896	-·016
May	30·013	30·025	-·012
June	29·986	30·002	-·016
July	29·968	29·983	-·017
August	29·962	29·977	-·015
September	29·961	29·962	-·001
October	29·899	29·915	-·016
November	29·897	29·908	-·011
December	29·943	29·959	-·016
Means	29·951	29·963	-·012

* Voyage of H.M.S. “Challenger,” Physics and Chemistry, ii, pt. 5.

174 NOTES ON METEOROLOGICAL OBSERVATIONS AT PLYMOUTH.

The correction for daily range in the above means for Plymouth is small, that derived from the Falmouth observations amounting to +0.003 inch during the month of June. I hope to determine its amount accurately by a full discussion of Dr. Merrifield's observations, supplemented by the readings of a Richard barograph now recording in the Laboratory.

Temperature.

The mean temperatures given below are calculated from the readings of maximum and minimum self-registering thermometers by the formula $T. = \text{Min.} + K (\text{Max.} - \text{Min.})$, where K has the following values :

K.	K.
January } 0.520	April } 0.476
December } 0.500	September } 0.470
February } 0.500	May } 0.470
November } 0.485	August } 0.465
March } 0.485	June } 0.465
October } 0.485	July } 0.465

(See title-page of Weekly Weather Report, 1884, Meteorological Office.)

Mean for Twenty-six Years, 1865—1890.

January . . . 41.9	June . . . 59.7	November . . . 46.4
February . . . 43.1	July . . . 62.6	December . . . 42.3
March . . . 43.9	August . . . 62.0	Mean . . . 51.2
April . . . 49.2	September . . . 58.2	
May . . . 53.8	October . . . 51.5	

Taking the fifteen years 1870—1884 for Plymouth, we may compare with the same period for Exeter, Babbacombe, Prawle Point, Dartmoor (Princetown?), and Bude as give in "Challenger" Report before quoted, reducing each to sea level by means of the correction 1° F. for 270 feet.

Stations.	Height in feet.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Plymouth	90	42.9	43.9	45.0	48.8	53.3	58.8	61.8	62.1	57.6	51.7	46.4	42.6	51.2
Exeter	164	41.1	43.2	44.9	48.8	53.9	59.5	63.4	63.1	58.1	51.4	44.4	41.2	51.1
Babbacombe . . .	293	42.9	44.1	45.0	48.3	52.9	58.5	62.0	62.3	58.3	52.4	46.8	42.8	51.4
Prawle Point . . .	350	43.4	44.3	45.0	48.1	52.3	57.3	61.1	61.6	58.5	52.8	47.5	43.9	51.3
Dartmoor	1372	42.1	43.1	44.6	48.9	52.3	58.0	61.0	61.1	57.5	51.4	45.9	42.4	50.7
Bude	16	42.1	43.4	44.6	48.3	52.6	57.8	60.6	61.3	57.7	52.4	45.9	42.6	50.8
Falmouth	211	45.2	45.5	45.8	48.8	52.9	58.1	61.1	61.7	58.4	53.4	48.4	45.2	52.0

From this table it appears that the curve of temperature at Plymouth is of a form intermediate between stations wholly exposed to the influence of the sea, and stations more inland. Thus on an average Plymouth is about 1° F. colder than Prawle Point during the winter months, and during the summer months about 1° F. warmer. On the other hand, Plymouth is 1.5° F. warmer than Exeter in winter, and in summer 1.5° colder. In spring and autumn the temperatures of these stations are almost identical, although it may be observed that in September the temperature of Plymouth shows a somewhat greater fall than occurs, *e. g.*, at Babbacombe, a phenomenon which, although not fully confirmed by the mean of the longer period, suggests the influence of the high plateau of Dartmoor in some peculiar seasons.

Humidity.

The hygrometric conditions are shown by the following readings of dry and wet bulb thermometers, the values being means for twenty-six years as before.

	Dry.	Wet.	Dew-point.	Pressure of vapour. Inches.	Relative humidity. Per cent.
January	41.4	40.4	39.1	.238	92
February	41.8	40.8	39.5	.242	92
March	42.3	40.6	38.6	.234	87
April	48.2	45.8	43.2	.279	84
May	53.8	50.6	47.5	.329	79
June	59.9	56.3	53.2	.406	79
July	62.3	59.1	56.4	.456	82
August	61.3	58.7	56.5	.457	85
September	57.2	55.5	54.0	.418	89
October	50.4	49.1	47.7	.331	91
November	45.1	44.0	42.7	.274	91
December	41.3	40.5	39.5	.242	94
Means	50.4	48.5	46.5	.317	87

Winds.

The following table gives the twenty-six years' average of the number of days in each month on which the wind blew from a point in each quadrant.

176 NOTES ON METEOROLOGICAL OBSERVATIONS AT PLYMOUTH.

Month.	N. by E. to E.	E. by S. to S.	S. by W. to W.	W. by N. to N.	Calm.
January	6	6	10	5	4
February	6	5	8	6	3
March	9	4	7	8	3
April	9	6	6	6	3
May	8	8	7	6	2
June	5	7	7	8	3
July	4	5	10	9	3
August	5	5	9	8	4
September	6	5	8	6	5
October	7	5	7	7	5
November	7	4	8	7	4
December	6	5	9	6	5
Sums	78	65	96	82	44

Taking the fifteen years 1870—1884 as before, and summing the values N.E. and E., S.E. and S., S.W. and W., N.W. and N., given in the "Challenger" Reports, for Falmouth at 8 a.m., we get the following :

Month.	Plymouth.					Falmouth.				
	N. by E. to E.	E. by S. to S.	S. by W. to W.	W. by N. to N.	Calm.	N. by E. to E.	E. by S. to S.	S. by W. to W.	W. by N. to N.	Calm.
January	7	6	10	4	4	4	9	11	7	—
February	6	6	8	5	3	4	8	11	5	—
March	9	4	7	8	3	6	6	9	10	—
April	9	6	6	6	3	9	5	8	8	—
May	9	5	7	8	2	9	6	7	9	—
June	4	6	8	9	3	3	7	10	10	—
July	3	5	11	9	3	3	6	14	8	—
August	6	5	10	6	4	5	5	12	9	—
September	6	4	8	7	5	4	6	11	9	—
October	8	5	7	6	5	4	8	10	9	—
November	8	4	8	7	3	4	6	11	9	—
December	6	5	8	7	5	3	6	12	10	—
Sums	80	60	100	82	43	58	78	126	103	—

These sums for the year for Plymouth are in close agreement with those for the longer period, and we observe, as compared with Falmouth, a considerable average of calms, and excess of north-easterly winds, which again point to the influence of high land as hinted in the temperature curve.

Rainfall.

The rainfall of Plymouth is an element the discussion of which raises many problems of the greatest interest, on account of its

peculiar position with respect to the entrance to the English Channel and to the high plateau of Dartmoor. The whole question is well worthy of full investigation. In the meantime one may give Dr. Merrifield's observations as they stand.

Averages for Twenty-six Years ending December, 1890.

	Rainy days.	Amount in inches.
January	19·4	3·965
February	16·4	2·960
March	14·0	2·615
April	13·5	2·252
May	12·1	2·140
June	12·0	1·892
July	14·5	2·839
August	14·2	2·680
September	14·3	3·692
October	18·4	3·660
November	17·3	3·557
December	18·4	3·775
Totals	184·5	36·027

The following notes are given by Dr. Merrifield:—"The average for five years is taken from the Quarterly Weather Report, Meteorological Office, January to March, 1870; rain gauge not used until January, 1869. In ten years from 1869 to 1878, Mr. Balkwill, Old Town Street (Plymouth), had 412·05 inches; Navigation School, 363·19 inches. Hence 13·45 per cent. should be added to Navigation School amounts. In five years from 1870 to 1874 Mr. Balkwill had 196·94 inches; Navigation School, 171·09, or add 15·11 per cent. to Navigation School; Drake's reservoir, 201·43 inches and 895 rainy days; Navigation School, 171·09 inches and 865 rainy days. Hence add 17·73 per cent. rain and 3·47 per cent. number of rainy days to Navigation School."

Sunshine.

Dr. Merrifield's records of the duration of sunshine begin with the year 1882. We have accordingly nine complete years, with the following results:

178 NOTES ON METEOROLOGICAL OBSERVATIONS AT PLYMOUTH.

	Total sunshine. Hrs. Min.	Percentage of possible.
January	41 33	16
February	76 48	27
March	130 27	36
April	171 53	42
May	198 25	40
June	202 59	42
July	187 17	38
August	197 52	45
September	146 56	39
October	98 25	30
November	57 57	22
December	49 56	20
Total	1560 28	33

Whence it appears that on the whole Plymouth enjoys one third of the possible bright sunshine, the proportion rising to nearly one half in August, and falling to one sixth in January.

The foregoing results are deduced from the averages computed by Dr. Merrifield, and comparisons have been made only with the material immediately to hand. They are, however, sufficient to show the great value of Dr. Merrifield's records, and of what may be expected from a full discussion.

Meteorological Observations at M.B.A. Laboratory, Plymouth, September, 1891, 9 a.m. and 9 p.m.

{ Lat. 50° 21' 49" N. }
 { Long. 4° 8' 21" W. }

Height of cistern of barometer above mean sea level 125.93 feet.
 " rain gauge 117.67 "
 " " " " ground 0.62 foot.

Day of month.	Mean barometer red. to 32° and to sea level.	Temperature.					Elastic force.	Relative humidity. Sat. = 100.	Wind.			Cloud amount, 0-10.		Sunshine, hours.	Ozone, 0-10.	Rain.	Remarks.
		Dry bulb.	Wet bulb.	Max.	Min.	Dew-point.			Direction.		Mean force, 0-13.	9 a.m.	9 p.m.				
									9 a.m.	9 p.m.							
1	29.627	57.7	55.3	62.4	56.0	53.1	.405	84	S.S.W.	S.S.W.	2	10	0	—	4	.000	Gale in forenoon.
2	29.872	56.2	55.0	60.2	54.7	54.0	.418	92	S.S.W.	Calm	1	10	0	1.70	1	.000	
3	29.979	57.7	55.2	61.6	53.8	52.9	.402	83	S.E.	S.W.	1	2	1	10.27	6	.000	Lightning at midnight.
4	30.102	56.7	54.8	62.8	54.7	53.1	.405	84	S.W.	S.W.	2	7	0	9.34	4	.000	
5	30.198	57.1	53.3	61.2	53.8	49.9	.360	77	S.W.	S.W.	3	7	0	4.61	5	.000	
6	30.015	57.3	56.2	61.5	55.6	55.2	.432	93	S.W. x W.	S.W. x S.	4	10	10	2.73	6	.275	
7	30.027	58.2	58.1	62.1	56.4	58.0	.482	100	S.S.W.	S.S.W.	1	10	10	0.71	7	.025	
8	30.114	60.6	58.1	64.0	57.1	55.9	.449	85	S.	N.E.	2	0	9	5.10	6	.010	
9	30.092	64.6	60.7	73.4	55.8	57.5	.474	79	E.S.E.	N.E. x N.	1	1	0	11.05	4	.000	
10	30.093	65.6	59.9	73.6	59.8	55.4	.439	70	E.N.E.	Calm	1	0	0	11.51	2	.000	
11	30.097	66.6	60.3	75.2	53.9	55.4	.440	68	E.N.E.	E. x N.	1	0	0	11.10	1	.000	
12	30.004	69.0	62.0	76.3	54.8	56.5	.459	65	E. x N.	N.E.	1	0	0	11.17	4	.000	Faint lunar halo p.m.
13	29.812	63.5	60.9	70.6	60.9	58.6	.494	85	E.S.E.	E.N.E.	1	7	4	1.04	6	.004	
14	29.950	57.4	55.2	62.6	53.1	53.2	.414	86	E.S.E.	W.	1	10	0	2.17	7	.040	Wind force 7 in afternoon.
15	30.269	56.0	53.4	61.3	47.8	51.0	.376	84	W.	Calm	1	8	9	3.37	1	.002	
16	30.351	57.1	55.6	60.5	48.8	54.3	.422	90	S.	W.S.W.	1	10	8	0.00	7	.000	Lunar halo p.m.
17	30.166	59.6	58.6	62.6	55.2	57.7	.478	94	W.	S.W.	4	7	10	2.97	5	.147	
18	30.034	60.3	60.3	62.3	59.0	60.3	.523	100	W.	Calm	1	10	10	0.00	6	.470	
19	29.995	59.4	59.4	61.8	58.4	59.4	.507	100	S.W.	S. x E.	2	10	10	0.00	6	.270	
20	29.823	55.0	52.4	59.8	52.5	50.0	.361	83	W. x N.	W.N.W.	2	9	9	3.12	6	.194	Wind force 7 at 2 a.m. Bar. min. 5 a.m.
21	29.834	51.6	50.1	58.2	48.9	48.5	.342	89	W.S.W.	N.	2	10	10	4.18	4	.039	Wind N.W., force 8, at 2.30 p.m.
22	29.935	54.5	51.4	61.4	50.9	48.5	.343	80	N.	N.E.	2	7	0	8.00	3	.000	
23	30.160	54.0	52.5	62.1	44.6	51.2	.378	90	E.N.E.	N.N.E.	0	0	0	9.12	7	.378	Lunar halo at midnight.
24	30.166	57.0	57.0	59.2	50.8	57.0	.466	100	S.	Calm	3	10	10	0.08	7	.100	
25	30.115	57.9	57.4	59.4	56.9	56.9	.465	97	S.	S.	1	10	0	0.02	6	.030	
26	29.931	57.4	55.5	62.2	55.6	53.7	.415	88	S.W.	W.	3	10	10	1.20	4	.000	Wind S.W., force 8, from 4 to 6 a.m.
27	30.140	54.9	52.0	61.9	52.0	49.3	.352	82	W.S.W.	W.S.W.	2	8	0	8.06	7	.000	
28	30.156	58.1	56.7	61.1	45.0	55.3	.437	90	S.S.W.	S.	2	8	0	8.50	6	.000	
29	29.950	56.6	56.0	59.2	55.4	55.6	.442	96	S.S.W.	S.W.	3	10	3	0.00	8	.102	Wind S., force 7 at 6 a.m.; wind force 7 at 4 p.m.
30	29.814	57.7	55.9	61.2	47.7	54.4	.424	89	S. x W.	S.S.W.	5	8	0	8.17	4	.447	Gale from midnight till 5 a.m. on 1st.
Means	30.027	58.5	56.3	63.4	53.7	54.4	.427	86.8			1.9	7	4	5.01	5	.084	

Rain on 14 days.
 Gales on 7 days.
 Fog on 9 days.

Wind.
 N. N.E. E. S.E. S. S.W. W. N.W. Calm.
 3 ... 6 ... 5 ... 3 ... 11 ... 17 ... 10 ... 0 ... 5 days.

Notes on the Herring, Long-Line, and Pilchard Fisheries of Plymouth (continued).

By **William Roach,**

Associate Member.

I.—Herring.

Date.	Tide.	Wind.	Weather.	No. of boats.	Catch per boat.	Price per 100.	Locality.	Remarks.
1890 Nov. 7	Flood	N.W.	Squally	—	300 and under	8/0	Cawsand Bay	A few nets were put down in Cawsand Bay on the 4th inst. and overhauled on the 5th inst., and it was found that a few herrings had arrived. A great many are getting their boats and nets in readiness for the approaching season.
14	—	—	—	4	100—200	4/0	Duke Rock	If the weather continues fine, with not much rain, there will soon be an increase in the fishing.
18	Spring	S.W.	Dull	1	300	4/6	Rum Bay to E. end of Breakwater	—
19	Ebb	S.W.	Mild	9	Very few	—		
20	"	W.S.W.	Threatening	16	2000 dn.	4/5—4/9	Rum Bay to Duke Rock	Large fish.
21	Neap	S.W.	Fine	25	2000	3/1—3/5	Ditto	—
25	Ebb in Sound, flood outside	N. by E.	Moderate	80	500	3/4—3/8	E. end of Breakwater to the Cobbler Buoy	—
26	Ebb in Sound, flood at sea	E. by N.	Stormy	8	800	3/4—3/6	N.W. of Staddon Heights, East Channel	Twelve boats with no fish.
28	Flood	S.E.	Wet	2	200	—	—	Sixty boats went to sea; but owing to the bright moon only two boats took fish.
Dec. 2	Ebb	E.	Gloomy	10	100	3/6—3/8	Taken W. of Staddon Heights	Herrings fallen off considerably.
3	Ebb at sea, slack water in Sound	N.	"	30	500	3/0—3/6	In East Channel and the Sound	—
4	Ebb outside, slack water in Sound	N. Fresh	"	30	800	2/9—3/0	Different stations in Sound	—
5	Ebb	—	—	40	600	2/5	Outside Breakwater	—
				20 Sound boats	700	—	Melampus Buoy and Breakwater Fort	Cawsand boats only taking a few hundred in their moored nets in Cawsand Bay, took them up and put

6	"	E. by S.	Wet	—	12,000	2/8-2/10	—	them in Whitsand Bay, and hauled them next day, taking from 10,000 to 12,000.
8	—	—	—	3	10,000	3/0	Whitsand Bay	—
9	Flood	E.	Gloomy	16 Drift,	10,000	1/8-2/0	S. of Mothecombe	—
				9 Looe,	30,000	1/3	Whitsand Bay	—
				20 Sound	8000	3/0-3/9	Between Melampus and Drake's Island	Fifty boats with only a few fish.
10	"	E.	Fresh	20	10,000	1/6	East Bay	—
				8	30,000	1/3	West Bay	This lot of herrings in the Sound was taken at 8 o'clock, during low water. Little boats almost sinking with fish. Sound fishery fallen off considerably. Boats still working, but taking no fish.
				—	8000	2/0	Sound	
11	"	E.	"	20	20,000	1/3-1/9	5 to 6 miles S.W. of Bolt Head	
12	"	E.	Gloomy	3 Drift	30,000	1/3	S. of Mothecombe, 5 to 6 miles	—
13	"	E.	Fine	15 "	40,000	10/0 per down 1000	Ditto	—
15	—	—	—	6 "	10,000	1/6-2/3	S.W. of Bolt Head, from there up and down	—
16	Flood	N.	Wet	12 "	—	2/0-2/4	5 to 6 miles S.W. of Bolt Head	—
17	Ebb	E.	Gloomy	20 "	20,000	1/6-3/0	Various stations	—
18	—	E.	Threatening	30 "	30,000	1/1-1/4	Between Mothecombe and the Bolt Head, 4 to 5 miles off land	—
20	Ebb	E.	Gloomy	25 "	20,000	1/0	Off Stoke Point	—
22	Slack water outside	E.	"	10 "	15,000	1/3	Off Stoke Point, Breakwater Light, S. of Mewstone	—
23	Ebb	E.	Fine	40 "	10,000	0/8-1/0	Various localities	—
24	"	E.	Gloomy	8 "	5000	0/8	Off Stoke Point	—
25	"	E.	"	5 "	2000	1/0	Ditto	—
26	Flood	E.	"	10 "	10,000	£2 10s. to £3 per last	6 miles S.E. of Stoke Point	—
27	"	E.	Very cold	8	5000	3/0	4 to 5 miles S. of Stoke Point	70 per cent. shotten (spent).
29	—	—	—	6	3000	2/10	2 to 3 miles off Stoke Point	The herrings have made no appearance in Sound this year.
30	Ebb	E.	Very cold	50	20,000	2/0-3/0	2 to 3 miles S. of Salcombe	—
31	"	E., blowing half a gale	Threatening for snow	80	30,000	2/8-2/10	Ditto	Two boats lost half their fleet of nets on account of heavy takes.

Date.	Tide.	Wind.	Weather.	No. of boats.	Catch per boat.	Price per 100.	Locality.	Remarks.
1891 Jan. 1	Ebb	E.	Threat- ening	5	12,000	Full 3/0, shotten 1/1-2/0	Off Mothecombe	60 per cent. shotten.
2	"	E.	Fine	30	20,000	2/6-3/6	Off Mothecombe, Break- water Light, between the Mewstone and land	—
3	"	E.	Gloomy	10	10,000	Full 3/1, shotten 2/0	Same as 2nd inst.	—
6	Slack water outside, 3 hours ebb in Sound	E.	Moderate	40	40,000	Full 3/0-3/6, shotten 1/6-2/0	Between Stoke Point and Bolt Head, 4 to 8 miles off land	—
7	1st hour flood	N.E.	Cold	30	25,000	1/8-2/3	Ditto	70 to 80 per cent. shotten.
8	2nd hour flood	S.	Threat- ening	20	15,000	Full 2/0, shotten 1/6	From Whitsand Bay to Bolt Head	One or two shoals travelling west.
10	Flood	N.E.	Fine	20	20,000	1/8-2/3	Between Stoke Point and Bolt Head, 1 to 2 miles off land	—
12	"	N.	Gloomy	10	20,000dn.	1/6-2/4	Ditto	—
13	"	N.	"	30	15,000	1/4-2/2	Same as 12th inst.	—
14	"	N.	Bright	10	20,000	1/5-1/11	1½ miles E. of Stoke Point	It is many years ago since such numbers of herrings have appeared in the East Bay.
15	Slack water	E.	"	30	30,000	1/5-2/0	1 to 3 miles S. of Stoke Point, from there to Bolt Head	—
16	Ebb	E.	"	15	10,000	1/8-2/0	1 to 3 miles S. of Stoke Point	—
17	"	E.	"	10	10,000	2/0-3/0	Ditto	—
20	"	S.W.	Stormy	6	1000	2/0	8 to 9 miles outside the Eddystone	—
26	—	—	—	20	400	1/6	In East Bay	—

II.—Long-Line.

The "Remarks" show very clearly how much difficulty is experienced in procuring suitable bait, and how this branch of the fishing industry is paralysed for want of it. The conclusion might also be drawn that salted pilchard makes but an indifferent bait.

Date.	Tide.	Wind.	Weather.	Bait.	Locality.	No. of boats.	Conger.	Ling.	Rays and skates.	Cod.	Pollack.	Other fish.	Remarks.
1890 Oct. 21	Ebb	N.W.	Fine	Squid	$\frac{3}{4}$ mile W. of the Eddystone	1	cwt. 3	12	Dozen. 3	—	1 doz.	3 doz. bream	—
22	"	E.	"	"	6 miles S.E. of the Mewstone	1	"	6	3	2	"	—	—
"	—	—	—	Pilchard	6 miles outside the Eddystone	1	—	700-800 spur	dog-fish	—	—	—	Nothing but spur dogs (<i>Acanthias</i>) taken.
29	Flood	W.	Wet	Squid	1 mile N.W. of the Eddystone	1	5	12	1 doz.	2	2 doz.	2 doz. bream	—
31	"	W.	Squally	"	3 to 4 miles S.W. of the Bolt Head	3	5	5 to 6	1 to 2	2 to 3	1 to 2 doz.	1 doz. bream	Weather extremely bad for long-line fishing.
Nov. 5	—	—	—	Squid	$\frac{3}{4}$ to $1\frac{1}{2}$ miles S.E. of the Eddystone	3	4	10 to 12	2 to 3	3 to 4	1 doz.	—	—
14	Flood	S.	Wet	—	—	—	—	—	—	—	—	—	—
17	"	S., moderate	Dull	Squid	5 to 6 miles S.E. of Stoke Point	3	3	7 to 8	2 to 4	3 to 4	5 to 6	—	—
19	Ebb	S.W.	Mild	—	On East Reites	1	2	12	2	—	—	—	—
21	—	—	—	—	Outside the Eddystone	2	—	—	3 to 4	—	—	—	Caught 100 spur dog-fish. There are a great number on the coast just now.
28	Flood	N.E.	Very cold	—	—	3	3	6	1 to 2	6	—	—	These boats only shot half their gear owing to strong wind.
Dec. 1	—	—	—	Squid	7 to 8 miles S. of Bolt Head	2	14 to 15	—	—	—	—	—	—
						1	5	6	2 to 3	6	—	—	4 to 5 hand-liners, which use 4 lines, landed 4 cwt. each.
						1	4						
3	Ebb	N.	Gloomy	"	7 to 8 miles off the Bolt Head	4	8	12	2 to 4	12	—	—	—
4	"	N.	"	"	"	2	4 to 6	2	2 to 4	12	—	—	—

Date.	Tide.	Wind.	Weather.	Bait.	Locality.	No. of boats.	Conger.	Ling.	Rays and skates.	Cod.	Pollack.	Other fish.	Remarks.
Dec. 16	—	—	—	—	8 to 10 miles S.W. of Falmouth Outside the Eddystone Off Bolt Head	1	wt. 9	Dozen. 9	4	12	—	—	—
						1	5	—	2	—	—	—	Lost half their gear.
						1	2	—	—	—	—	—	—
29	Flood	E.	Gloomy	Squid	4 to 5 miles S. of Stoke Point	2	4 to 5	3 to 4 1/6 ach	—	—	—	Owing to the strong east wind and strong tides, these boats had to shoot their long lines near home. All the conger run from only 4 to 12 lbs. in weight.	
1891 Jan. 5	Ebb	E.	Fine	Squid and pilchard	6 to 8 miles S. of the Bolt Head	6	10½ down	12	7 to 8	—	—	—	The boat which had the largest catch had 900 hooks baited with squid and 500 with pilchard. It is very difficult for long-liners to shoot now, owing to the drift-net fishery, which is carried on all the week excepting Saturday night.
						1	1½	—	4	—	—	1000 dog-fish.	
12	Flood	N.	Gloomy	—	15 miles S.W. of Eddystone Between Start Point and Bolt Head, 6 to 7 miles off land	5	—	—	4	—	—	—	The men say the reason why they took no fish was owing to the extreme cold and the strong tides. One boat lost all its long line. This is owing to the drift-nets becoming entangled in the buoys attached to the long lines.
Feb. 4	—	—	—	Half squid half pilchard	8 to 10 miles S.W. of Bolt Head	2	5	6	5 to 6	3	—	—	—
					1½ miles E., W., and S. of the Eddystone	5	3	£2 worth of rays, skates, ling, and cod	—	—	—	—	
					14 miles S.W. of Eddystone	1	2½	—	Rays £1	—	—	—	—

				Pilchard	Off Falmouth, 7 miles S. of Mewstone	1	No conger	—	5	—	—	—	—
9	—	—	—	—	—	7	3	12	3 to 5	—	—	—	—
10	—	—	—	Pilchard	½ mile N.W. of Eddystone	5	2	—	3 to 4	—	—	—	—
11	—	—	—	„	4 miles S.W. of Bolt Head	5	5	12 to 24	5 to 6	—	—	—	These boats have been successful in obtaining plenty of pilchard bait (which realised 18/0 per 1000).
14	Ebb	S., light	Bright	Squid	5 miles S.W. of Bolt Head	10	5	12	6	—	—	—	—
16	„	S. by W.	Fine	„	5 to 6 miles S.W. of Bolt Head	4	10	12	3 to 4	5 to 6	—	—	Each boat spent 10/0 for bait.
19	„	E., strong	Gloomy	Pilchard	„	15	3	—	3 to 4	6 to 7	6 to 7	—	Pilchard sold this day for bait by auction realised 35/0 per 1000, then there was not enough for all the boats, weather being so fine and fish making good prices.
26	Flood	E.	Bright	Squid	25 miles S.W. of Eddystone	1	1½	12	9	—	—	—	The bait used had been salted a week. All other long-liners been in harbour for want of bait.
Mar. 7	—	—	—	—	—	—	—	—	—	—	—	—	Long-liners received pilchard bait from Falmouth this evening at 6 o'clock at a cost of from 25/0 to 30/0 per 1000, caught in moored nets. These boats have been in harbour for a week waiting for bait, and now they have it the weather is setting in stormy. The bait was salted.
23	—	—	—	Pilchard and squid	12 to 15 miles S.W. of Start Point	6	1	5 to 6	7	—	—	—	Bait been in salt for a fortnight.
24	—	—	—	Salt pilchard and squid	10 miles S. of the Deadman	3	1 conger	24	8	—	—	—	Other boats never saw a conger, only having a few rays.
25	—	—	—	Fresh squid	E. side of the Eddystone	1	5	—	—	—	—	—	—
				„ Salt squid 14 days old	—	1	2½	—	2	—	—	—	—
					—	1	—	—	—	—	—	—	—

III.—*Pilchards.*

If, from the data supplied by Mr. Roach, we make an estimate of the fish landed in each of the four months, the totals come to be—
In Oct. 322,750; in Nov. 923,500; in Dec. 4,128,500; in Jan. 2,795,000. These figures give a total for the season of 8,169,750 pilchards.

Date.	Tide.	Wind.	Weather.	No. of boats.	Catch per boat.	Price per 1000.	Locality.	Remarks.
1890 Oct. 8	—	S.W.	—	30	4000 to 5000	11/0	—	—
15	—	S.	Foggy	12	10,000	11/0	—	—
16	—	N.W., strong	—	—	No pilchards	—	—	Too much wind for net-fishing.
20	—	—	—	—	—	—	—	—
21	Ebb	N.W.	Fine	15	2000 to 3000	13/0-15/0	6 to 8 miles W. of the Eddystone	—
22	„	E.	„	20	1000 and under	19/0	6 to 8 miles S.W. of Rame Head	—
23	„	E.	„	—	500	/0 per 100	Ditto	—
24	„	W.	„	20	2000	16/0	6 to 12 miles W. of the Eddystone	—
31	Flood	W.	Squally	12	1000	15/0	10 to 15 miles W. of the Eddystone	—
Nov. 10	„	S.W.	Bright	3	15,000	21/0	5 to 6 miles S.S.W. of the Rame Head	Very large fish.
14	„	S.	Wet	50	4000	20/0	4 to 6 miles S. and S.W. of Penlee Point	Each boat had a few herrings; also several hundred of half-grown mackerel.
17	Strong	S.E., moderate	Dull	20	2000	14/0	3 to 4 miles S.S.W. of the Eddystone	—
19	Ebb	S.W.	Mild	10	10,000	13/0	1½ miles N.W. of Eddy- stone, from there up and down	—
20	Ebb	W.S.W.	Threat- ening	20	20,000	11/0-11/6	5 miles S.W. of Rame Head, from there inside the Eddystone	—

21	Neap	S.W.	Fine	20	10,000	11/0-12/0	2 miles inside the Eddystone	—
22	Flood	W.	Moderate	5	50,000	11/0-12/0	3 miles S.S.W. of Rame Head	Taken at 1 o'clock in the morning, after the moon went down.
25	Ebb in Sound, flood outside	N. by E.	„	15	10,000	13/0	Between Rame Head and Eddystone	—
26	Ebb in Sound, flood at sea	E. by N.	Stormy	10	5000	12/6-13/0	Ditto	Fifty boats without fish.
28	Flood for a short time	N.E.	Very cold	20	5000 and under	13/0	Between Penlee and Eddystone	Large quantity of boats only a few hundred fish. They were sold to the pilchard curers, and sent by vessels to Cornwall.
29	Flood	E., showers of small sleet	„	10	2000 to 3000	13/0	Ditto	Several boats came back again owing to the strong wind.
Dec. 1	—	—	—	5	5000 to 6000	12/0	Ditto	The west country buyers will not take these fish because they were caught on Sunday.
5	—	—	—	60	—	13/0-14/0	Ditto	Owing to there being no seine pilchards in the west, there is a good demand for the drift pilchards here at present. All large boats came back again.
9	Flood	E.	Gloomy	7	30,000	14/0-15/0	10 miles outside the Eddystone	—
10	„	E.	„	20	10,000	16/0	8 to 10 miles S. of Plymouth	Owing to the strong east wind fish going to deeper water; largest catches outside the Eddystone.
11	„	E.	„	20	20,000	12/0	5 to 6 miles S.E. of Eddystone	—
12	„	E.	„	30	10,000	11/6-12/0	7 to 8 miles S. of Mewstone, from there in and outside the Eddystone	—
13	„	E.	Fine	20	10,000	11/0	7 to 8 miles S. of Mewstone	These boats have taken 60,000 to 70,000 small mackerel in their pilchard and herring nets.
16	„	N.W.	Wet	40	20,000	10/0-12/0	N.W. of the Eddystone	—
17	Ebb	E.	Threatening	12	20,000	12/0	Various localities	4000 to 5000 small mackerel in their pilchard-nets.
18	„	E.	Gloomy	40	30,000	—	7 to 8 miles S. of Mewstone, from there S. and W.	—
23	Slack water outside	E.	Fine	10	10,000	12/0	N.E. of Eddystone	—

Date.	Tide.	Wind.	Weather.	No. of boats.	Catch per boat.	Price per 1000.	Locality.	Remarks.
Dec. 24	Ebb	E.	Gloomy	6	2000 to 3000	12/0	2 to 3 miles inside the Eddystone	—
29	—	—	—	—	—	—	—	Owing to the prevailing east wind, the pilchards have fallen off considerably during the last few months.
1891 Jan. 2	Ebb	E.	Fine	20	25,000	10/0-12/0	4 to 8 miles S.E. of Eddystone	—
3	„	E.	Gloomy	15	25,000	6/0-8/0	Ditto	—
6	Slack water outside, 3 hours ebb in Sound	E.	Moderate	20	70,000	6/0-10/0	6 to 10 miles S.E. of Eddystone	—
7	1st hour flood	N.E.	Cold	7	20,000	10/0	Ditto	A large quantity of small mackerel taken in the pilchard-nets (but none in herring-nets), 4000 to 5000 down; sold at 2/0 to 3/0 per 100.
8	2nd hour flood	S.	Threatening	8	20,000	10/0	15 to 20 miles S. of P. H. Harbour	Almost all boats in harbour.
10	Flood	N.E.	Fine	10	10,000	8/0-10/0	8 to 10 miles S.E. of Eddystone	Some of these boats, having 2000 to 6000 small mackerel, sold at 2/0 to 2/6 per 100.
13	—	N.	Gloomy	5	6000	12/0	Ditto	2000 to 4000 small mackerel, sold at 3/0 per 100. There were never so many small mackerel taken before in this locality.
14	Flood	N.	Bright	5	6000	11/0	8 to 10 miles S.S.E. of Eddystone	One boat, 10,000 small mackerel, sold at 3/0 to 5/0 per 100.
15	Slack water	E.	„	8	5000	12/0	8 to 9 miles S.S.E. of Eddystone	Several thousands of small mackerel, sold at 2/0 per 100.
16	Ebb	E.	„	5	4000	12/6	Ditto	—
26	—	—	—	—	—	—	—	Pilchard season is now finished, and the buyers have stopped curing. There are two or three boats trying still. They catch bait for long-liners. Not nearly so many pilchards taken this year as last.
28	—	—	—	—	—	—	—	Both pilchard and herring boats now commence fishing mackerel.