

Report on Trawling in Bays on the South Coast of Devon.

SUBMITTED FOR THE INFORMATION OF THE
DEVON SEA FISHERIES COMMITTEE.

By

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THE investigations dealt with in this memorandum were commenced in the autumn of 1895, and have been carried on, as opportunity permitted, until July of the present year. The observations were made in 1895 and 1896 by Mr. F. B. Stead, in 1897 by Mr. S. D. Scott and myself, and in 1898 by myself. A preliminary memorandum, dealing with the observations made in 1895, has already been submitted to the Committee by Mr. Stead. As a matter of general convenience it is reprinted as an appendix to this Report.

The area included in our enquiry consists of Start Bay, Torbay, and Teignmouth Bay. By a bye-law of the Fisheries Committee, confirmed June 27th, 1893, it was made illegal to use a fish-trawl in these bays, and I presume that the assistance of the Marine Biological Association was invited in order that the Committee might learn to what extent their prohibition of trawling may be justified by the biological conditions of the grounds concerned.

Before proceeding to review our results I must advert to the inadequacy of our records, which is due to the insufficiency of the means at our disposal. The grounds lie at a considerable distance from Plymouth, and in order to carry out our work we have been obliged either to hire a Brixham sailing trawler, or to take round the Laboratory steam-launch, which cannot often be spared from her regular duties. If we hired a trawler, we had to take our chance of the weather, with the probability of finding the wind either too strong or too light for satisfactory working. Moreover, although it was possible at a good deal of personal inconvenience to accurately record the catch, subsidiary observations of great

practical importance, such as the examination of the reproductive organs and food of fish taken, of the pelagic ova present in the water, and of the nature of the general fauna inhabiting the grounds, were only carried out with the greatest difficulty on account of the lack of accommodation and apparatus. The Laboratory steam-launch is well equipped, but she is only a 57 ft. boat, and cannot venture round the Start except in fine weather. Once on the ground, a change of wind is very apt to imprison her in Dartmouth or some other harbour. I trust that the above considerations may be held to explain the delay in furnishing the present Report, and its incomplete condition.

In considering the records before me, I do not see that it is possible to proceed except upon the assumption that the various hauls made at the same season, though in some cases in different years, were made under practically identical conditions. I do not suppose that this is really the case, since absolute seasonal regularity is not a characteristic of any fishery with which I am acquainted; but I do not see any possibility of tabulating the possible effects of weather with anything like accuracy, whether from the particulars furnished in the records or from the publications of the Meteorological Office. In so far as the work of the *Busy Bee* is concerned, it is fair to assume that the weather was reasonably fine before and during her operations, as otherwise they would have been prevented; but this takes no account of the general weather of the season, nor can I claim to possess the local knowledge indispensable to a just appreciation of the probable effect on the fishery.

On the whole, while I should be very loath to deduce from our records any positive opinion as to the abundance of fish at particular seasons, I believe that they furnish a fairly exact idea of the proportions of large and small fish likely to be met with; and, as I apprehend, it is chiefly with the question of possible destruction of undersized fish that the Committee is concerned.

It is proposed, whenever sufficient material shall be available, to discuss the general question of the distribution of fish and their migrations in the whole south-western district. It is a question which cannot fail to have an important bearing on practical fishery matters, but I do not think it can be conveniently dealt with in isolated parts. I shall therefore omit from consideration in this memorandum all details of life, history, food, migration, &c., and confine myself to a brief recapitulation of such facts as appear to be of immediate importance.

All food-fishes taken were measured by Mr. Stead to the nearest quarter of an inch, with the exception of skates and rays. The latter were considered by Mr. Scott and myself to be of economic importance, and are therefore included in our records, together with all fish whatso-

ever, and, in fact, all organisms brought up by the trawl, while efforts were made by us to ascertain what other forms, too small to be retained in the meshes, were present on the grounds over which we worked. In the subjoined lists I have, for the sake of brevity, grouped all food-fishes recorded under inches. It will be understood that a fish of, say, 8 inches may have been either 8, $8\frac{1}{4}$, $8\frac{1}{2}$, or $8\frac{3}{4}$ inches in actual length, measured from the tip of the snout to the end of the tail. Rays are treated exceptionally, the dimension given being the width of the disc, since some part of the comparatively unimportant tail is often missing. Except in the case of plaice, fish of less than 8 inches are grouped together, since I believe that no one will contend that such small creatures can be the object of a legitimate fishery.

In considering the proportional numbers of fish of different sizes, I have grouped together as "unsaleable" all plaice and dabs of *less than 8 inches*, a proceeding which appears to be in accordance with local market custom. The Sea Fisheries Bill of 1898 sought to prevent the sale, &c., of plaice, dabs, and soles *not exceeding 8 inches*, which is a slightly higher standard.

For convenience I have placed the standard of sexual maturity for plaice at 12 inches, though my colleague, Mr. J. T. Cunningham, who investigated the matter in this district, found that the average size at which female plaice, the larger and more numerous sex, begin to breed is slightly above 12 inches. Dabs are small fish, which may be mature even before they are saleable, so that the economic and biological limits sufficiently correspond. Soles are mature at about 12 inches, and until they reach such a length are only "slips" in the eyes of the fish-buyer, and as such do not command a very exalted price. The other species which figure in our records are so far from numerous that it is hardly necessary to discuss the question of their maturity. When taken in any number it will be found that the majority were so small as to be economically worthless, whether mature or not.

In the case of plaice I have introduced a standard of a purely arbitrary nature. Considering that fish reaches, even on the southern and south-western coasts, a length of 25 inches, I do not think that my standard of 15 inches for "large" fish will be held to be ridiculously high.

In reviewing the evidence afforded by our records, it has been unnecessary for me to deal, except very briefly, with the biological conditions affecting the question of the protection of small fish. The matter has already been discussed at some length by Mr. Stead, whose conclusions are in essential agreement with those which I have repeatedly put forward on previous occasions,

START BAY.

LIST OF HAULS.

In the subjoined list the details of locality, &c., entered in the records of the various naturalists who have had charge of the observations have been greatly condensed. For practical purposes the bay appears to be divisible into two parts, the line of demarcation being from the Start to the southern edge of the Skerries bank, along the bank, and from its northern end, marked by the bell buoy, to Combe Point. The area within this line is for the most part a smooth stretch of fine sand, from 6 to 10 fathoms. South of Torcross are a number of outlying rocks, and towards the Skerries the sand gets coarse. Extending the area a little to the north-west, we include all that part of the bay which appears to be of much interest to trawlers. The usual professional haul was made, according to my information, either parallel to the sands or along the inner edge of the Skerries and to some distance along the south edge. The coarse sand and shelly ground alongside of the bank is presumably rich in crabs, since numbers of crab-pots are set there; and it may be well understood that the prosecution of trawling and crabbing on the same ground did not tend to peace and harmony.

Such of our hauls as are described as "off the sands" were made parallel to the shore, usually between Torcross and Rockvale, at distances sufficiently indicated by the soundings. The initials "T." and "B.B." indicate that the hauls so marked were made by the smack *Thistle*, of Brixham, and the Association's steam-yacht *Busy Bee* respectively. The former carries a trawl of 40 ft. beam, the latter one of 27 ft. beam. The difference in the size of the mesh of the two nets is insufficient to require special attention. Sailing trawlers are generally held to catch more soles than steam vessels. Otherwise, given equal speed and equal skill, I suppose there is not much difference in catching power. Everyone knows that trawling is usually more successful by night than by day, but night-work offers great inconvenience when the catch has to be examined and measured. I do not know to what extent the difference of light affects the size as apart from the number of fish caught. With one exception all our hauls were made in the day-time.

I.	T. Off the Sands	.	7 fath.	3 h. 30 m.	20 x. '95
II.	T. Inside the Skerries	15 to	5 fath.	3 h. 55 m.	29 x. '95
III.	T. " "	14 to	8 fath.	3 h. 50 m.	31 x. '95
				(night)	
IV.	T. Off the Sands	.	10 fath.	3 h. 50 m.	4 xii. '95
V.	T. " "	.	9 fath.		12 xii. '95

VI.	T.	Off the Sands	.	8½ fath.	2 h. 20 m.	27 i. '96
					(bad weather)	
VII.	T.	" "	.	9 fath.	6 h.	28 i. '96
VIII.	B.B.	" "	.	7 to 9 fath.	3 h. 55 m.	11 iii. '96
IX.	T.	" "	.	9 fath.		21 x. '96
X.	T.	" "	.	8 fath.	55 m.	23 iii. '97
XI.	T.	" "	.	8 fath.	2 h. 50 m.	24 iii. '97
XII.	T.	" "	.	8 fath.	1 h. 15 m.	24 iii. '97
XIII.	B.B.	" "	.	7 to 6 fath.	2 h. 15 m.	26 v. '97
XIV.	B.B.	" "	.	9 to 6 fath.	2 h. 20 m.	26 v. '97
XV.	B.B.	" "	.	8 to 10 fath.	3 h. 5 m.	27 v. '97
XVI.	B.B.	Outer part of bay, off Dartmouth		14 to 17 fath.	1 h. 20 m.	27 v. '97
XVII.	B.B.	Outer part of bay, off Dartmouth		18 to 24 fath.	2 h. 25 m.	28 v. '97
XVIII.	B.B.	Off the Sands	.	9¾ fath.	1 h. 10 m.	3 vi. '97
XIX.	B.B.	" "	.	7½ fath.	1 h. 45 m.	25 vii. '98
XX.	B.B.	" "	.	10 fath.	2 h.	26 vii. '98
XXI.	B.B.	Outer part of bay, off Dartmouth		20 to 22 fath.	1 h. 35 m.	28 vii. '98

TABLE I.

List of Fish caught in Start Bay.

PLAICE.

No. of Haul—i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.	xi.	xii.	xiii.	xiv.	xv.	xvi.	xvii.	xviii.	xix.	xx.	xxi.	
4 in.—	—	—	—	—	—	—	9	—	1	—	—	—	—	—	—	—	—	—	—	—	
5 „	—	—	—	—	—	—	22	—	4	7	—	2	5	1	—	—	2	—	—	—	
6 „	—	—	—	1	1	—	9	—	4	13	4	3	6	4	—	—	13	6	3	—	
7 „	—	—	1	—	—	—	4	14	1	2	11	12	10	7	3	2	—	10	3	5	
8 „	1	1	9	2	1	—	4	26	9	3	21	10	6	12	2	3	—	4	2	5	
9 „	6	1	18	3	10	—	2	21	7	2	25	10	3	8	1	2	1	6	2	5	
10 „	11	10	31	9	20	—	—	29	27	1	7	2	3	2	—	1	—	1	4	5	
11 „	36	13	42	28	26	—	—	23	52	3	22	5	4	1	—	—	1	5	—	6	
12 „	14	14	48	37	29	—	1	17	92	—	12	3	2	2	1	1	2	2	2	1	
13 „	10	7	40	36	29	—	1	8	57	—	11	2	—	2	—	2	1	—	2	2	
14 „	4	9	21	27	15	—	1	5	30	1	10	6	1	1	—	1	—	1	—	2	
15 „	4	4	13	11	11	—	—	5	15	1	3	1	—	—	—	—	1	—	3	—	
16 „	3	1	10	5	4	—	—	2	6	—	4	—	—	1	—	—	—	—	—	1	
17 „	2	—	4	1	4	—	—	1	2	—	2	—	—	—	—	1	—	2	—	—	
18 „	—	—	2	2	—	—	—	1	—	—	2	—	—	—	—	1	—	—	—	—	
19 „	—	—	3	—	—	—	—	1	1	—	—	—	—	1	—	—	—	—	—	—	
20 „	—	—	2	1	—	—	—	1	1	—	1	—	1	—	—	—	—	—	—	—	
21 „	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	
22 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
23 „	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	
24 „	—	—	2	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	
Total	91	60	246	163	150	0	13	195	301	22	151	55	35	48	13	14	5	48	21	37	1

DAB.

DAD.																					
No. of Haul—i. (Under 8 in.)	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.	xi.	xii.	xiii.	xiv.	xv.	xvi.	xvii.	xviii.	xix.	xx.	xxi.	
92	24	271	14	10	—	7	72	7	41	160	70	16	22	28	6	4	36	33	48	—	
8 „	52	8	198	10	15	—	2	18	18	34	19	1	9	4	2	—	5	5	9	—	
9 „	21	1	132	48	13	—	1	6	32	4	14	8	1	3	2	1	2	5	2	10	
10 „	12	12	47	31	7	—	—	4	15	1	3	3	4	1	—	3	—	3	1	—	
11 „	7	10	14	28	6	—	3	—	6	—	3	1	2	2	3	1	—	3	—	—	
12 „	4	9	6	13	4	—	1	—	3	—	1	—	1	—	1	—	2	1	—	—	
13 „	—	3	—	8	1	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	
14 „	—	2	—	3	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	
15 „	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Totl.	188	69	668	155	57	—	14	102	82	64	215	102	25	37	38	13	8	53	41	67	

FLOUNDER.

(Under 8 in.)	—	—	—	—	—	—	—	1	—	—	1	3	—	—	—	—	—	—	—	—	—
8 „	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
9 „	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—
10 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
11 „	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
12 „	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
13 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Total	—	—	—	—	—	—	—	2	—	—	2	5	—	1	—	—	—	1	—	—	—

LEMON SOLE OR MERRY SOLE.

12 in.	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	1	—	—	—	—	—
13 „	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	1	—	—	—	2	—	—	1	—	—	—	—	—

SOLE.

(Under 8 in.)	—	—	—	—	—	—	—	—	—	—	—	1	—	9	—	—	—	—	—	2	—
8 „	—	1	—	1	—	—	1	—	1	—	—	—	—	3	—	—	—	—	—	3	—
9 „	—	1	3	1	—	—	—	—	1	1	—	—	1	2	—	—	—	—	—	2	4
10 „	2	1	10	—	—	—	2	—	9	—	—	—	—	—	—	—	—	—	3	3	—
11 „	3	2	12	—	—	—	1	—	11	—	—	—	—	3	—	—	—	—	1	1	—
12 „	—	1	7	—	—	—	—	—	3	—	—	—	1	—	—	—	—	—	1	—	—
13 „	1	1	1	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	2	—	—
14 „	—	—	—	—	—	—	—	1	2	—	—	—	—	—	—	—	—	—	—	—	—
Total	6	7	33	2	—	—	4	1	28	1	—	1	3	17	—	—	—	—	9	13	—

SAND SOLE.

(Under 8 in.)	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8 „	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9 „	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10 „	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

TURBOT.

No. of Haul—	i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.	xi.	xii.	xiii.	xiv.	xv.	xvi.	xvii.	xviii.	xix.	xx.	xxi.
10 in.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
11 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12 „	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
13 „	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
14 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15 „	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	1	—	—	1	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—

BRILL.

11 in.	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12 „	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
13 „	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	2	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

COD.

19 in.	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
20 „	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—

WHITING.

(Under 8 in.)	—	—	—	1	11	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—
8 „	—	—	—	3	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9 „	—	—	—	4	6	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—
10 „	—	—	—	25	18	—	—	—	7	—	—	—	—	—	—	—	—	—	—	—	—
11 „	—	—	—	26	14	—	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—
12 „	—	—	—	13	4	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
13 „	—	—	—	3	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
14 „	—	—	—	2	2	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—
15 „	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	78	63	—	—	—	17	1	1	—	—	—	—	—	—	1	—	—	—

DORY.

(Under 8 in.)	—	—	2	—	1	—	—	—	—	—	—	—	—	—	1	2	1	—	1	—	—
8 „	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10 „	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
11 „	4	—	—	3	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
12 „	4	1	2	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
13 „	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14 „	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	14	1	4	5	2	—	—	—	—	—	—	—	—	—	1	4	1	—	1	—	—

TUB OR LATCHET.

No. of Haul—i. (Under 8 in.)	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.	xi.	xii.	xiii.	xiv.	xv.	xvi.	xvii.	xviii.	xix.	xx.	xxi.
8	—	—	—	2	—	—	—	—	6	14	8	2	5	3	—	—	5	1	2	—
9	—	—	—	—	—	—	—	—	—	2	1	—	—	—	—	—	—	1	6	—
10	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—
11	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—
12	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
13	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
14	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
15	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	6	—	2	—	—	—	6	17	9	2	5	3	4	—	7	3	8	—

GREY GURNARD.

(Under 8 in.)	40	—	—	—	—	—	2	—	1	9	1	3	6	55	2	1	15	17	12	—
8	24	—	15	1	1	—	—	—	—	1	1	—	—	—	—	—	—	1	—	—
9	—	—	—	1	—	—	—	—	1	3	—	—	—	—	—	—	—	—	1	—
10	—	—	—	1	—	—	—	1	8	—	—	—	—	—	—	—	—	—	—	—
11	—	—	4	5	2	—	—	—	2	—	—	—	—	—	—	1	—	—	—	—
12	—	—	3	7	1	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—
13	—	—	3	3	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	2	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	24	40	27	20	8	—	—	3	13	1	13	2	3	6	55	2	1	16	18	13

RED GURNARD.

(Under 8 in.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	9	—	—	—	—
8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	—	—	—	—
9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	10	—	—	—	—

PARROT GURNARD.

9 in.	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—

THORNBACK (Raja clavata).

(Under 8 in.)	—	—	—	—	—	—	—	—	1	—	—	8	6	8	—	—	1	—	—	—
8	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	1	—	—
9	—	—	—	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—
10	—	—	—	—	—	—	—	—	—	—	—	—	2	1	—	—	1	2	—	—
11	—	—	—	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—
12	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	—	—	—
13	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	1	—	—	—	—
14	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
Total	?	?	?	?	?	?	?	?	?	2	1	3	10	10	13	1	—	5	5	—

PAINTED RAY (R. microcellata).

No. of Haul—i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.	xi.	xii.	xiii.	xiv.	xv.	xvi.	xvii.	xviii.	xix.	xx.	xxi.
11 in.	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
12 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
13 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15 „	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
16 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
17 „	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—
18 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
19 „	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
20 „	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
21 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
22 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
23 „	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
Total	?	?	?	?	?	?	?	?	?	2	2	1	—	1	—	—	—	—	2	—

BLONDE RAY (R. blanda). Large smooth spotted ray.

(Under 8 in.)	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	—	—	—	—	—
8 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—
11 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Total	?	?	?	?	?	?	?	?	?	1	—	—	—	—	3	1	1	—	—	—

HOMELYN (R. maculata). Small smooth spotted ray.

(Under 8 in.)	—	—	—	—	—	—	—	—	—	1	—	—	8	7	13	5	1	—	1	1	—
8 „	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	2?
9 „	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—
Total	?	?	?	?	?	?	?	?	?	1	—	—	9	7	14	7	1	—	1	1	2?

TABLE II.

Numbers and Percentages of Fish at given sizes at different seasons in Start Bay.

PLAICE.

	Season—March. Hauls—viii., x.—xii. Hours—9 hrs.	May, June. xiii.—xv., xviii. 8 hrs. 50 mins.	July. xix., xx. 3 hrs. 45 mins.	Oct. i.—iii., ix. 15 hrs. ca.	Dec. iv., v. 8 hrs. ca.
Unsaleable	112	66	17	2	2
Under 8 inches	26%	46%	29%	0%	0%
Immature	322	124	46	276	101
Under 12 inches	76%	86%	79%	39%	32%
Large	26	8	4	76	31
15 inches and over	6%	6%	7%	11%	10%
Gross number	423	144	58	698	313

DABS.

Unsaleable	343	102	81	394	24
i.e., under 8 inches	71%	67%	75%	39%	11%
Gross number	483	153	108	1007	212

Besides the species entered in Table I, our record includes, of marketable kinds, only a few small **pout** and an occasional **herring**.

In the later records, kept by Mr. Scott and myself, appear **spur-dogs**, **rough-dogs**, **angels** or buffoons (*Rhina squatina*), **dragonets**, locally known as miller's thumbs or sting-fish, **scald-fish** (*Arnoglossus laterna*), and **solenettes**. The dog-fish and angels, rapacious creatures all, would be of some importance if very numerous, which they were not. The solenette deserves a little attention, since this small fish, which hardly exceeds a length of five inches, is quite commonly regarded, even by fishermen, as the young of the marketable sole. Readers who, having experience of the bay, may not be familiar with the distinctive character of the several species of sole, will understand that the scanty number of small soles is accounted for by the elimination of solenettes.

Plaice are no doubt the most important fish found in the bay, since, although their individual value is far less than that of soles, turbot, or even brill, they are infinitely more abundant than those species. Glancing at Table II, we see that the proportion of unsaleable fish in October and December is less than 1 per cent. No reliable conclusions can be drawn from the two hauls made in January. The first haul (vi.) in bad weather was utterly blank, while the second (vii.) in six hours produced only 13 plaice. It is impossible to judge to what extent they may be normally present on the ground at this season. It is evident that they are difficult to catch in foul weather, and this, I believe, is the common experience of trawlers on similar shallow grounds. The explanation usually offered is to the effect that the fish bury themselves in the sand, and the little evidence which I have been able to collect on the subject does not contradict this view.

In March the percentage of unsaleable plaice rises to 26; in May and June to 46; while the general supply appears to be less in summer than in spring. In July, if two hauls give any reliable data, the supply remains about the same, but the percentage of unsaleable falls to 29.

Turning to the proportion of immature fish, this from March to July is never less than 76 per cent. In October it falls to 39, in December to 32 per cent.

Large fish, *i.e.*, those of 15 inches and above, appear to be never numerous. In October they stand at 11 per cent.; in the spring and summer at 6 to 7 per cent. only.

Dabs appear to be numerically more abundant than plaice at all seasons except during the month of December. From March to July the proportion of unsaleable is from 66 to 75 per cent., falling in October to 39, and in December to 10 per cent.

The number of **soles** entered in our records is too small to be reduced to percentages, but it is apparent that no "unsaleable" fish were taken except in May and July. A sole, as we have seen, ceases to be a "slip" at about the size at which it becomes capable of reproducing its species; and out of the total of 103 fish taken in all hauls we find only 23 mature. None of them exceed the very modest length of 14 inches. The best sole ground, according to my information, is along the inner edge of the Skerries. Hence our operations, mostly conducted over different ground, cannot be said to be fully representative. I shall have occasion to allude to this matter later on.

Sand soles (*Solea lascaris*) are of little importance unless taken in large numbers and of the full size of about 10 or 12 inches. The so-called lemon sole or **merry sole** (*Pleuronectes microcephalus*) is apparently too scarce in the bay to demand attention. The few **turbot** and **brill** taken were all immature, and too small to be very valuable. If **cod** ever form an important item of a trawler's catch in the bay our records furnish no evidence of the fact. **Whiting**, when encountered, were mostly immature, and nearly all so small as to be hardly worth catching. **Dories** were few and mostly immature and unsaleable, but the destruction of the young of this species appears to be much less here than on offshore grounds generally. **Tub gurnards** were hardly plentiful at any season, and, while the majority were unsaleable, the total does not comprise a single full-grown fish. **Grey gurnards**, abundant at times, were mostly unsaleable, except in December, when only a few were large enough to command the full price. These fish are addicted to rather sudden roving, so that there is always some risk of error in results deducted from a small number of observations of their capture. Such as it is, our evidence suggests that large numbers of immature forms are liable to be destroyed by trawling in the bay in summer and autumn, without any adequate compensation in the capture of marketable material. **Red gurnards**, as might be supposed, are not found in the shallow part of the bay; **Parrot gurnards**, or "Polperro bull-dogs," only as occasional immigrants from the deeper water which they habitually affect.

With regard to rays, we have no evidence of the supply in October and December. **Painted rays** do not appear to be common in the spring and summer. **Homelyns** are only represented by small examples. **Blondes** are rarer, and, relative to the adult size, very small. **Thornbacks** are the most numerous, and some are of good size; but it may be said of all rays that while the supply in spring and summer appears hardly sufficient to be remunerative, the proportion of unsaleable specimens is very considerable.

TORBAY.

LIST OF HAULS.

According to my information, the best trawling ground in the bay is supposed to lie along the inner side of the Ridge, thence on towards Paignton, and round outside the Ridge towards Brixham. Hauls entered as "round the Ridge" will be understood to have been made as far as possible on these lines.

I.	T.	Across the bay from near Berry Head to $\frac{1}{2}$ m. off Torquay pier . . .	3 hrs. 20 min.	1 xi.'95
II.	T.	Inside the Ridge and on to Paignton . . .	2 hrs.	1 xi.'95
III.	T.	Same as II. . .	1 hr. 50 min.	15 i.'97
IV.	T.	Round the Ridge . . .	1 hr. 20 min.	26 iii.'97
V.	T.	" " . . .	1 hr. 40 min.	26 iii.'97
VI.	B.B.	" " . . .	1 hr. 25 min.	2 vi.'97
VII.	B.B.	" " . . .	1 hr. 35 min.	2 vi.'97
VIII.	B.B.	" " . . .	1 hr. 40 min.	27 vii.'98
IX.	B.B.	Central part of bay . . .	45 min.	27 vii.'98

TABLE III.

List of Fish caught in Torbay.

		PLAICE.							
No. of Haul—	i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.
1 inch	—	—	—	—	—	—	—	1	—
2 inches	—	—	—	—	—	—	—	—	—
3	"	—	—	—	1	—	—	—	—
4	"	—	—	11	8	16	8	19	—
5	"	—	—	5	7	21	18	108	—
6	"	—	—	5	5	16	10	81	1
7	"	3	1	4	3	7	1	16	—
8	"	5	2	6	5	15	2	7	2
9	"	9	5	6	10	19	6	16	2
10	"	7	1	8	13	25	9	14	2
11	"	17	4	5	24	34	5	20	3
12	"	21	7	5	26	30	6	21	5
13	"	7	3	2	19	31	3	18	2
14	"	3	1	1	1	10	2	7	—
15	"	—	2	—	2	7	2	4	1
16	"	—	1	—	4	—	6	—	2
17	"	1	—	—	1	1	—	—	—
18	"	—	—	—	—	—	—	1	—
19	"	—	—	—	—	1	—	—	—
20	"	—	—	—	—	1	—	—	—
Total	73	27	58	128	234	79	331	22	89

DAB.

No. of Haul—i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.
(Under 8 inches) 40	6	83	2	10	22	88	4	155
8 inches 2	—	—	3	6	1	23	—	6
9 „ 10	1	1	—	3	2	4	—	1
10 „ 2	3	2	—	—	2	2	—	—
11 „ 4	2	—	—	—	1	—	—	1
12 „ 1	—	1	—	—	1	—	—	1
13 „ 1	—	—	—	—	—	2	—	—
Total	60	12	87	5	19	29	119	4 164

FLOUNDERS.

(Under 8 inches)	—	—	—	—	1	2	2	—	—
8 inches	—	—	1	—	2	—	5	—	—
9 „	—	—	1	—	2	—	1	—	—
10 „	—	—	1	—	1	1	4	—	—
11 „	—	—	2	—	3	—	5	—	—
12 „	—	—	2	1	4	—	3	—	1
13 „	—	—	—	1	3	—	2	—	—
14 „	—	—	—	—	—	—	—	—	—
15 „	—	—	1	—	—	—	—	—	—
Total	—	—	8	2	16	3	22*	—	1

* Noted as in bad condition.

SOLE.

(Under 8 inches)	—	—	—	—	—	1	—	—
8 inches	—	—	—	—	—	1	4	—
Total	—	—	—	—	—	1	5	—

BRILL.

(Under 10 inches)	—	—	—	—	1	—	1	—
Total	—	—	—	—	1	—	1	—

WHITING.

(Under 8 inches)	33	—	6	—	—	—	—	—
8 inches	7	—	8	—	—	—	—	—
9 „	5	—	1	—	—	—	—	—
10 „	4	—	—	—	—	—	—	—
Total	49	—	15	—	—	—	—	—

TUB.

(Under 8 inches)	—	—	—	—	8	4	10	—
8 inches	—	—	—	—	—	—	1	—
9 „	—	—	—	—	—	—	2	—
10 „	—	—	—	—	—	—	—	—
11 „	—	—	—	—	—	—	1	—
12 „	—	—	—	—	—	—	1	—
Total	—	—	—	6*	8	4	15	—

* Small fish ; actual sizes not recorded.

GREY GURNARD.

No. of Haul—i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.
(Under 8 inches)	—	—	—	—	—	—	—	7
Total	—	—	—	—	—	—	—	7

THORNBACK.

(Under 8 inches)	—	—	—	—	—	1	6	—	2
8 inches	—	—	—	—	—	1	1	1	—
9 "	—	—	—	—	—	—	—	1	—
10 "	—	—	—	—	—	—	—	—	—
11 "	—	—	—	—	—	—	—	1	—
12 "	—	—	—	—	—	—	1	—	—
13 "	—	—	—	—	—	1	—	—	—
16 "	—	—	—	—	—	—	—	—	1
25 "	—	—	—	—	—	—	—	—	1
Total	?	?	—	—	—	3	8	3	4

TABLE IV.

Numbers and Percentages of Fish at given sizes at different seasons in Torbay.

PLAICE.

	Season—January. Hauls—iii. Hours—1 hr. 50 mns.	March. iv., v. 3 hrs.	June. vi., vii. 2 hrs. 55 mns.	July. viii., ix. 2 hrs. 25 mns.	November. i., ii. 3 hrs. 20 mns.
Unsaleable	25	84	261	27	4
Under 8 inches	43%	23%	64%	25%	4%
Immature	50	229	340	96	54
Under 12 inches	86%	63%	83%	87%	54%
Large	0	16	13	4	4
15 ins. and over	0%	4%	3%	4%	4%
Gross number	58	362	410	110	100

DAB.

Unsaleable	83	12	110	159	46
Under 8 inches	95%	50%	74%	95%	64%
Gross number	87	24	148	168	72

Our list contains a few kinds of fish not entered in Table III. As in the case of Start Bay, the deleterious kinds are not sufficiently numerous to demand attention, and the others need not here concern us.

It will be noticed that the proportions of **plaice** fluctuate throughout the seasons in a rather irregular manner. This may in part be due to the paucity of our material in January, only 58 fish being recorded. Another explanation, however, is forthcoming, viz., that January is the spawning season, when the bulk of the big fish are out on the spawning grounds, about 15 miles off Berry Head (if I am rightly informed on this point). If plaice spawn at all in Torbay it is contrary to anything that I know of the general habit of the species, so that during the spawning season one would expect to find there only immature fish and a few of the smaller mature ones, which, speaking broadly, ripen later in the season than their larger brethren. This, in effect, is the condition actually indicated by our record. To correspond with the numerical abundance in March, the January figures should be much higher, but the weather in the earlier month was not propitious. The fish taken were in good condition, but 43 per cent. were unsaleable.

In March the proportion of both unsaleable and immature fish falls considerably, though both remain high. The fall may be presumed to be in part accounted for by the return of spent fish from the spawning grounds. The mature fish were noted to be in very poor condition, "running away to water," as the skipper of the *Thistle* expressed it. In June the proportion of "unsaleable" rises very perceptibly, but it must be admitted that in haul vii. we gave the Ridge rather a wider berth, and so hauled closer to the shore than is usual with professional trawlers. The percentage of immature fish shows a corresponding rise in this month.

In July we found the Ridge unfit for trawling owing to the great quantity of drift weed, so made our second haul, a very short one, in the central part of the bay. Here plaice were numerous, but small and nearly all immature. The few that we got round the Ridge comprised a reasonable proportion of good fish, but the two hauls, taken together, put the proportion of immature rather higher than in June of the previous year. In November (1895) fish seem to have been scarce. More than half were immature, but few were unsaleable. I believe, from experience elsewhere, that it is not unusual for the big fish to draw away from the shore in this month to re-assemble later on in the spawning grounds.

Around the Ridge, as may be gathered from Table III., **dabs** are certainly less numerous than plaice, except (always?) in January. In the central part of the bay this condition is reversed, but the proportion of unsaleable fish is very high throughout the year. It reaches its lowest

point, 50 per cent., in March. Dabs are known to spawn, to some extent, in inshore waters, though I have little experience of their doing so in Devonshire bays.

Other marketable flat-fish require, unfortunately, but little consideration. **Soles** are represented by only two small specimens. **Merry soles** were never taken, though I believe that they sometimes, if not often, enter the bay. **Flounders** appear to be permanent inhabitants, or at any rate are to be taken in small numbers throughout the year. No **turbot** were taken, and only one **brill**, of unsaleable size, was observed. **Whiting**, **tub gurnard** and **grey gurnard** appear to be not only scarce, but too small to be worth catching. The same remark applies almost equally to **thornbacks**, during the months when the rays were recorded. No other kinds of ray were observed.

TEIGNMOUTH BAY.

LIST OF HAULS.

The trawling ground in this bay lies roughly parallel to the shore at depths ranging from 5 to 10 fathoms. Our experiments were made on courses which do not appear to differ from each other to such an extent as to require separate definition. The ground appears to be very liable to become covered with drift weed in the summer.

I.	T.	.	.	.	.	30	x.	'95
II.	T.	.	.	.	.	"
III.	T.	.	.	4 hrs.	30 min.	2	xii.	'95
IV.	T.	.	.	.	.	"
V.	T.	.	.	.	.	12	x.	'96
VI.	T.	.	.	.	.	"
VII.	T.	.	.	.	.	"
VIII.	T.	.	.	.	.	"
IX.	T.	.	.	2 hrs.	25 min.	12	i.	'97
X.	T.	.	.	2	" 30 "	"		
XI.	B.B.	.	.	2	" 50 "	25	iii.	'97
XII.	B.B.	.	.	1	" 5 "	1	vi.	'97
XIII.	B.B.	.	.	0	" 50 "	"		
XIV.	B.B.	.	.	1	" 40 "	"		
XV.	B.B.	.	.	2	" 20 "	"		

TABLE V.

*List of Fish caught in Teignmouth Bay.**PLAICE.*

Haul—i. Inches.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.	xi.	xii.	xiii.	xiv.	xv.*
3	—	—	—	—	—	—	—	—	—	2	—	—	—	—
4	—	—	—	—	—	—	—	—	—	45	3	5	—	8
5	—	—	—	—	11	3	—	2	6	102	12	10	5	46
6	1	7	2	—	26	11	1	2	29	26	152	21	7	4
7	10	46	14	2	38	29	8	5	35	11	91	2	10	6
8	14	72	12	6	24	31	12	8	17	12	38	1	1	4
9	55	80	18	24	26	64	19	16	6	25	18	—	—	4
10	90	124	31	70	27	101	30	25	9	22	15	—	4	6
11	47	78	13	81	11	76	29	12	6	21	11	3	3	2
12	25	34	8	58	11	52	24	17	2	15	11	1	4	3
13	10	9	3	18	7	12	9	10	—	3	3	2	4	2
14	1	3	3	6	5	2	2	3	1	1	1	1	—	1
15	3	—	—	6	3	2	3	2	—	2	1	2	2	—
16	—	—	1	2	2	—	—	—	—	—	—	3	—	2
17	—	—	—	—	—	—	—	—	—	—	—	—	—	—
18	—	—	—	—	1	—	—	—	—	—	—	1	—	1
19	1	—	—	—	—	—	—	2	—	1	—	1	—	—
20	—	—	—	—	—	—	—	—	—	—	—	—	—	—
21	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Total 257 453 105 273 192 383 137 102 107 145 490 53 50 38 106

* The net came up loaded with weed, which had to be removed by cutting the meshes. In this process many small flat-fish escaped.

DAB.

(Under 8)	53	45	118	94	—	112	4	16	47	101	56	6	4	9	20
8	29	34	28	26	—	26	5	16	—	—	3	—	2	5	2
9	14	24	11	19	—	29	23	13	—	2	—	—	—	1	3
10	—	16	4	12	—	16	9	4	—	1	2	—	—	—	—
11	—	4	4	1	—	1	4	—	—	1	—	—	—	2	—
12	—	1	—	4	—	—	3	—	—	2	—	—	—	—	—
13	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	97	124	165	156	?	184	48	49	47	107	61	6	6	17	25

FLOUNDER.

(Under 8)	—	—	—	—	—	—	—	—	1	—	2	1	—	—	—
8	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—
9	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
Total	—	—	—	—	?	—	—	—	1	—	5	1	—	—	—

LEMON SOLE OR MERRY SOLE.

Haul—i. Inches.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.	xi.	xii.	xiii.	xiv.	xv.
10	—	—	2	—	1	1	—	—	—	—	—	—	—	—
11	—	—	—	—	—	1	—	—	—	—	—	—	—	—
12	—	—	—	—	—	2	9	—	1	—	—	—	—	—
13	—	—	—	—	—	1	—	—	1	—	—	—	1	—
14	1	—	1	—	—	—	—	—	—	—	—	—	—	—
Total	1	—	1	2	?	4	11	—	2	—	—	—	1	—

SOLE.

(Under 8)	—	—	—	—	—	—	—	—	1	—	—	—	—	1
8	—	—	—	—	—	—	—	—	1	—	—	—	—	—
9	—	—	1	—	—	1	—	4	—	—	—	—	1	—
10	—	—	1	—	—	4	—	2	—	—	—	—	—	1
11	—	—	1	—	—	1	—	1	—	—	—	—	—	—
12	—	1	—	—	—	—	—	—	—	—	—	—	—	—
13	1	—	1	1	—	—	—	—	—	—	—	—	—	1
14	—	—	—	—	—	1	—	—	—	—	—	—	—	1
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—
16	—	—	—	—	—	—	—	—	—	—	—	—	—	—
17	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Total	1	1	5	1	?	7	—	7	2	—	—	—	1	4

TURBOT.

12	—	—	1	—	—	—	—	—	—	—	—	—	—	—
13	—	—	—	1	—	—	—	—	—	—	—	—	—	—
14	—	—	—	—	—	—	—	—	—	1	—	—	—	—
Total	—	—	1	1	?	—	—	—	—	1	—	—	—	—

BRILL.

(Under 10)	—	—	—	—	—	—	—	1	—	2	2	3	2	1
10	—	—	—	1	—	—	1	—	—	1	—	—	—	—
11	—	1	—	—	—	1	—	—	—	—	—	—	—	—
12	—	—	—	—	—	1	—	—	1	—	—	—	—	—
13	—	—	—	—	—	—	—	—	—	—	1	—	—	—
14	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	1	—	—	—
19	—	—	—	—	—	—	—	—	1	—	—	—	—	—
Total	—	1	—	1	?	2	1	—	1	2	3	4	3	2

COD.

Haul—i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.	xi.	xii.	xiii.	xiv.	xv.
Inches.														
13	—	—	—	—	—	1	—	—	—	—	—	—	—	—
14	—	—	—	—	—	1	2	—	—	—	—	—	—	—
15	—	—	—	—	—	3	—	—	—	—	—	—	—	—
16	—	—	—	—	—	—	—	—	—	—	—	—	—	—
17	—	—	—	—	—	—	—	—	2	—	—	—	—	—
Total	—	—	—	—	?	4	3	—	2	—	—	—	—	—

WHITING.

(Under 8)	—	16	30	—	—	—	—	—	1	—	—	—	—	—
8	—	—	—	—	—	—	—	—	1	—	—	—	—	—
9	—	—	1	1	—	1	1	—	—	—	—	—	—	—
10	—	—	5	2	—	—	5	1	—	—	—	—	—	—
11	—	—	2	—	—	3	2	—	—	—	—	—	—	—
12	—	—	1	—	—	1	1	—	—	—	—	—	—	—
13	—	—	1	—	—	—	2	1	—	—	—	—	—	—
14	—	—	—	—	—	—	1	—	—	—	—	—	—	—
15	—	—	—	1	—	—	—	—	—	—	—	—	—	—
Total	—	16	40	4	—	5	12	2	1	1	—	—	—	—

DORY.

Under 8	—	—	—	—	—	—	—	—	—	—	—	1	3	—
Total	—	—	—	—	?	—	—	—	—	—	—	1	3	—

GREY GURNARD.

(Under 8)	—	1	—	—	—	—	—	—	—	9	1	3	1	1
8	—	—	—	—	—	—	—	1	—	—	—	—	—	—
9	—	—	—	—	—	2	—	9*	—	1	—	—	—	—
10	1	—	—	—	—	10	4	—	—	—	—	—	—	1
11	—	—	—	—	—	3	—	—	1	—	—	—	—	—
12	—	—	—	—	—	—	—	—	—	—	—	—	—	—
13	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	1	1	—	—	?	15	4	9	1	1	10	1	3	2

* Between 9 and 11 inches.

TUB GURNARD.

(Under 8)	—	—	—	—	—	—	—	1	—	33	4	6	3	3
8	—	—	—	—	—	—	—	—	—	—	1	1	1	1
9	—	—	—	—	—	—	—	—	—	—	—	—	1	—
10	—	—	—	—	—	—	—	1	—	—	—	—	—	—
11	—	—	—	—	—	—	—	—	—	—	—	—	2	—
Total	—	—	—	—	?	—	—	2	—	33	5	7	7	4

THORNBACK.

Haul—i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.	xi.	xii.	xiii.	xiv.	xv.
Inches. (Under 8)—	—	—	—	—	—	—	—	—	—	2	3	9	2	8
8 —	—	—	—	—	—	—	—	—	—	1	—	2	—	6
9 —	—	—	—	—	—	—	—	—	—	3	1	2	—	2
10 —	—	—	—	—	—	—	—	—	—	4	4	1	—	3
11 —	—	—	—	—	—	—	—	—	—	2	3	—	—	1
12 —	—	—	—	—	—	—	—	—	—	6	2	2	3	1
13 —	—	—	—	—	—	—	—	—	—	6	4	—	1	2
14 —	—	—	—	—	—	—	—	—	—	3	1	1	—	—
15 —	—	—	—	—	—	—	—	—	—	1	2	—	1	—
16 —	—	—	—	—	—	—	—	—	—	4	—	1	1	—
17 —	—	—	—	—	—	—	—	—	—	2	2	1	2	—
18 —	—	—	—	—	—	—	—	—	—	1	—	—	1	—
19 —	—	—	—	—	—	—	—	—	—	3	2	—	3	—
20 —	—	—	—	—	—	—	—	—	—	—	—	—	1	—
21 —	—	—	—	—	—	—	—	—	—	—	—	—	2	—
22 —	—	—	—	—	—	—	—	—	—	1	—	—	2	—
23 —	—	—	—	—	—	—	—	—	—	—	—	—	—	—
24 —	—	—	—	—	—	—	—	—	—	2	—	—	—	—
Total ?	?	?	?	?	?	?	?	?	?	41	24	19	19	23

HOMELYN.

8 —	—	—	—	—	—	—	—	—	—	3	—	1	—	2
10 —	—	—	—	—	—	—	—	—	—	—	1	—	—	—
13 —	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Total ?	?	?	?	?	?	?	?	?	?	3	2	1	—	2

BLONDE.

(Under 8)—	—	—	—	—	—	—	—	—	—	—	3	—	—	—
8 —	—	—	—	—	—	—	—	—	—	—	1	—	—	—
13 —	—	—	—	—	—	—	—	—	—	—	1	—	—	—
15 —	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Total ?	?	?	?	?	?	?	?	?	?	—	6	—	—	—

Pout (*Gadus luscus* or *G. minutus*) are the only other marketable fish which appear in our records. Their numbers are quite unimportant. Of unmarketable species, solenettes, scald-fish, topknots (*Rh. unimaculatus*), dragonets, angels or buffoons, and various dog-fish appear in hauls subsequent to x. In Haul x. Mr. Scott has noted that dog-fish were abundant, but in subsequent hauls both dog-fish and angels, which may be regarded as deleterious forms, were not taken in any considerable number.

TABLE VI.

Numbers and Percentages of Fish at given sizes at different seasons in Teignmouth Bay.

PLAICE.					
	Season—January. Hauls—ix., x. Hours—4 hrs. 55 mns.	March. xi. 2 hrs. 50 mns.	May, June. xii.-xv. i., ii., v.-viii. 5 hrs. 55 mns.	Oct. i., ii., v.-viii. ?	Dec. iii., iv. ?
Unsaleable . . .	105	392	171	198	18
Under 8 inches . .	42%	80%	69%	14%	5%
Immature . . .	227	474	212	1269	273
Under 12 inches . .	90%	97%	86%	89%	72%
Large . . .	3	1	14	19	9
15 inches and over .	1%	0%	6%	1%	2%
Gross number . . .	252	490	247	1424	378
DAB.					
Unsaleable . . .	148	56	39	230	212
Under 8 inches . .	96%	92%	72%	46%	66%
Gross number . . .	154	61	54	503*	321

* The record of dabs in Haul 5 has been mislaid.

Fish of species not entered in Table V. were in no way important. Throughout the year it would appear that the **plaice** are for the most part immature, while the percentage of unsaleable is very high in spring and summer, and considerable even in January. In October and in December it is comparatively low. **Dabs** are evidently less abundant than plaice, and, except in October, most of them appear to be unsaleable. **Merry soles**, though not taken in large numbers, were saleable, and probably for the most part mature. **Soles** do not appear to be numerous, though a fair catch might perhaps be made at night, but would consist, as I infer, largely of immature "slips." The few **turbot** recorded are small, and probably all immature. Two mature **brill** were taken, but the rest were mostly unsaleable as well as immature. **Cod** are only represented by a few codling. **Whiting** may, perhaps, be taken in remunerative numbers by night, and appear to be mostly saleable (if rather small), except in October and December. Large **grey gurnard** appear to be scarce, while **tub gurnard** are much too small to be legitimately fished. **Thornbacks** seem to be an important item of the catch. Many are so small as to be comparatively worthless, while a fair number are quite unsaleable, but I cannot say that the proportion of the latter, having regard to the usual distribution of young and old in this species, is unusually high.

GENERAL CONSIDERATIONS.

I think it will be conceded that the preceding records indicate, in so far as they can be considered representative, that the three bays do not form a homogeneous area, characterised by similar conditions of fish supply throughout. Start Bay and Torbay show a certain similarity, if we restrict our attention to **plaice**, but there is a marked difference in the proportion of immature fish in the later months of the year. Thus in Start Bay these fish are 39 per cent. of the whole in October and 32 per cent. in December, while in Torbay they are 54 per cent. in November. Teignmouth Bay differs from either, in that the proportion of immature plaice never falls below 72 per cent. I imagine that the facts are of more interest to the Committee than their explanation, which may probably lie in the close proximity of the estuary of the Exe, apparently the chief nursery of young plaice in the district, to Teignmouth Bay.

Without undertaking the responsibility of suggesting legislative action, I think I may endeavour to indicate, in so far as my acquaintance with the local conditions permits, the probable effects of any modification of the existing bye-laws.

Any interference with the unrestricted prosecution by fishermen of their calling may be presumed to have for its object either the increase of the fish supply or the protection of one class of fishermen at the expense of another. The last case involves social considerations which I am not concerned to discuss, as they lie within the province of the political economist rather than that of the naturalist.

For the protection or increase of the supply a number of methods have been advocated, such as the prevention of the destruction of small fish (different standards of size being suggested), whether by prohibition of capture or prohibition of sale, the institution of a close season, etc. On the whole the imposition of a size limit, however enforced, seems to have found most favour, but opinions differ as to the size. The Sea Fisheries Bill of 1898 sought to make illegal the sale, &c., of plaice and soles not exceeding 8 inches in length. It must be supposed that the Parliamentary Committee, on the recommendations of which the Bill was based, held that the protection of fish of less size would in itself benefit the supply. A Fisheries Committee cannot deal with sales, but the Devon Committee has taken effectual means to prevent the destruction, at least by trawlers, of either large or small fish in the bays. If it be held that the limit proposed by the Parliamentary Committee is adequate, our tables show that the existing bye-law is superfluous in Start Bay, and probably in Torbay during the months of October, November, and December, while it is hardly necessary

in Teignmouth Bay in December, since there are hardly any plaice under 8 inches to be caught. It is possible, however, that the Fisheries Committee may consider that the prohibition of sale of fish which are so small as to be practically unsaleable will not greatly alter existing conditions, and that an effort should be made to extend protection until the fish have reached a somewhat larger size. If this be the case the limit advocated will probably coincide with the size at which the fish becomes capable of reproducing its species, and so contributing to the up-keep of the stock. Plaice, the species with which we are almost entirely concerned, mature, as has been shown, at about 12 inches, and if this principle of protection be accepted it is obvious that no modification of the existing bye-law is advisable at any period of the year either in Teignmouth Bay or Torbay. In Start Bay it does not appear that the proportion of immature fish is higher in December than on offshore grounds. What may be the conditions in this bay in January and February the weather has never permitted us to ascertain.

Assuming that the protection of immature fish suffices, and that a proportion of 30 per cent. of such fish is that normally met with in company with large plaice on offshore grounds, it would appear that the bye-law might be relaxed in Start Bay in winter without much injurious effect in so far as the fish supply is concerned. It is not my business to recommend such a relaxation, and the Committee is probably aware that the southern edge of the Skerries, which appears to be a favourite trawling ground, is equally appreciated by the crabbers. Crabbing and trawling are industries little calculated to flourish on the same ground, especially by night. Supposing it to be possible to prevent interference with crabbing by restricting trawling to the northward of a line drawn from the Bell Buoy to Tinsey Head, and if this limit were respected (it is for the Committee to judge by what means respect could be enforced), the bay would remain in part a sanctuary for soles throughout the year. I take it that no one will be inclined to refuse to soles any sort of protection which can be afforded them, whether large or small.

I do not think that the proposal to establish a close time for sea fish has ever been seriously entertained, but I am by no means sure that beneficial results would not be achieved by diverting the attention of trawlers from fish of a given species at the time when the larger members of that species are engaged in spawning. It is well known that in any species the larger mature females yield more eggs than their smaller sisters, and that as a rule they are the earliest spawners. I myself believe that the larger fish produce not only more numerous but more vigorous offspring, capable, speaking generally, of attaining

a larger size than the offspring of fish which have only just reached the mature condition. Large plaice are spawning, if I am correctly informed, in January. Means might be taken to tabulate the spawning period with greater exactitude, and I believe that the Committee might profitably consider to what extent the opening of Start Bay during this month (or during the earlier part of the spawning period) would have the effect of diverting the attention of trawlers from the large plaice when the latter are spawning. In this connection the weather is of great importance, since a gale of wind off the land is in itself a most efficient protector of spawning fish on distant grounds, while the opening of the bay would, under such meteorological conditions, submit the species to a persecution which they at present escape. In any modification of existing arrangements intended to protect large fish while spawning it would be essential to avoid any risk, by too early opening of inshore grounds, of molesting the breeders before they have hauled off the land, and I am certain that the date of the outward migration varies somewhat in different years.

A Fisheries Committee appears to have the power of dealing with trawling in inshore waters by various methods besides those already referred to, viz., by regulation of the hour and duration of hauls, and of the size of mesh, and by the prohibiting of the removal of fish from a fishery. It is a well-established fact that small fish, especially the hardier kinds of flat-fish, are not necessarily killed by being caught in the trawl, if the latter is only hauled for a short time and the ground is fairly clean. It is, of course, essential that the small fish, if they are to be saved, should be promptly returned to the sea. With regard to mesh, I doubt whether any alteration of size and pattern is practicable, since to restrict trawling in the bays to the use of a certain kind of net might be equivalent to closing them altogether, on account of the expense entailed by equipping the boats with two sets of gear. There can be no doubt as to the beneficial action of regulations dealing with duration of hauls and removal of small fish, if such can be effectually enforced; but I suppose that a man of affairs, before recommending any legislation on these lines, would consider how far the means at his disposal would be likely to render it effective.

In the above remarks I have directed my attention almost entirely to plaice, and only a few words appear to be necessary in respect of the other fish met with in the bays. Soles require no further notice. Merry soles and flounders appear to be unimportant. Turbot and brill are few and small, and, as such, may very well continue to enjoy the protection of the bye-law; nor can I find any reason to think that the closure of the bays is otherwise than beneficial to whiting and gurnards,

which appear to be represented almost entirely by immature and unsaleable individuals.

Dabs require separate consideration. They are very abundant in the bays, and, except in Start Bay in December, a very large proportion of them is immature and unsaleable. But the dab is a small fish, which at no time enjoys a very exalted commercial value, while its flesh deteriorates very rapidly. Furthermore, it is commonly regarded by naturalists as a serious competitor in the matter of food with the more valuable kinds of flat-fish, in the company of which it is usually taken. Unlike the plaice, it is not by any means confined in its immature condition to any particular ground, and shows hardly any discrimination in the locality in which it spawns; while in addition to consuming large quantities of organisms, which might be more profitably employed in the architecture of young plaice and soles, it is practically omnivorous. Probably in virtue of this adaptability of feeding and habitat the dab continues to abound. At least, I have never heard it seriously contended by any responsible observer that the species has been greatly reduced in number by over-fishing. That it may have decreased in average size is quite possible, since although, as our records show, the length may occasionally reach 15 inches even in this district, 13 inches is much more frequently the size of the largest individuals met with. It is not unlikely that protection might result in slightly increasing the average size, and so in slightly raising the market value of the fish, but it is more than doubtful whether any useful end would be served by any sort of means specially directed to the preservation of this species. In giving evidence at an enquiry held during the present year with regard to a bye-law prohibiting the use of "tuck-nets" in Start Bay, I had occasion to speak of dabs in the same sense as appears above. Mr. Fryer, in his report to the Board of Trade, considered that my remarks with regard to dabs went a long way towards condemning the bye-law. The responsibility is his, not mine, for it is one thing to say that a dab needs and deserves no protection, and another to hold that small plaice ought not to be preserved for fear that the dabs should benefit by the same protection. The question of "tuck-nets" is outside the scope of our present enquiry. In the case of trawling in the bays our records sufficiently prove that all other considerations must be subordinated to the conditions affecting plaice. I should hesitate to advise that dabs are so deleterious that their extermination in the bays would justify the great destruction of small plaice that must ensue if the process were carried out in the course of ordinary professional fishing. In the good old days of which we hear, when valuable fish are said to have abounded, plaice must be supposed to have been able to maintain a successful competition with dabs, and food-fish generally with worthless

or predatory forms. The balance appears to have been upset by the interference of man, but it is very difficult to advise how it may be satisfactorily adjusted again.

There is some risk even in the assertion that such worthless and predatory forms as sharks and dog-fish are wholly noxious, since their depredations among valuable fish may be partly compensated by the destruction which they inflict on each other and on small competitive forms. I am nevertheless inclined to think that the dog-fish commonly met with by trawlers, spur-dogs, nurse, rough-dogs, and angels or buffoons, do more harm than good, and may safely be killed when encountered. From the results of enquiries which I have made I doubt whether trawlers take any trouble in this matter: Spur-dogs, perhaps the most destructive of all, are likely enough to succumb to exposure on deck before they are shovelled overboard, but nurse, rough-dogs and buffoons are very tenacious of life, though easily disposed of by the judicious use of the heel of a sea-boot.

I have endeavoured to set forth above all the more important points raised by our enquiry, in so far as they can be limited to the single industry of trawling. I see no reason to change the opinion which I have long held, that the practical treatment of questions dealing with the supply of flat-fish cannot be limited to trawling alone, but must embrace all fisheries which are prosecuted on any part of the area tenanted, at different phases of their life history, by these fish.