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Diurnal Changes in Trawl Catches of Plaice, Dab and Sole

by

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Introduction

Although it is very widely known that diurnal changes occur in trawl catches, published data are comparatively few.

Diurnal changes in the catches of plaice (Pleuronectes platessa L.) were described by de Groot (1964). They all give data showing higher catches during the day in the southern North Sea. However, there are exceptions. During the spawning period (Jan.-Febr.), the night catches on the spawning site exceed the day catches (de Groot, 1964). Parrish et al. show that in the northern part of the North Sea the catches are higher during the night hours.

Diurnal changes in the catches of dab (Limanda limanda L.) are given by Parrish et al. The night catch is about 4 times the day catch.

The diurnal changes occurring in the trawl catches of sole (Solea solea L.) have been known for a long time. Already Heape (1887) describes the diurnal variation in the catch of sole. Cunningham (1890) advanced the hypothesis based on both tank observations and the catch, that the sole feeds at night during spells of greater activity. By means of this he was able to explain the catch difference during the 24 hrs fishing period. Kruuk (1963) showed experimentally that Cunningham's hypothesis was correct. The marked diurnal changes typical of trawl catches of sole have been described by Boerema (1964) and Woodhead (1964). Their data were predominantly based on the catches of research vessels in certain months of the year and to a lesser degree of commercial vessels. A summary of published data on diurnal variations in trawl catches, also of other flatfish species, is given by de Groot (1967).

Diurnal Variation in Trawl Catches

In the years 1959-60 data on the catch per haul, marketable as well as discards, were collected by the skipper of the cutter UK 81 (150 hp). The cutter mainly fished in the ICES rectangles J 5, J 6, and K 6. For each trip of at least 24 hrs the catch per haul was expressed as a percentage of the average catch per haul of that trip. The average relative catch of plaice, dab and sole within each two-hour period has been plotted in Figure 1. This Figure is based on 1,063 hauls (for data see Table 1). In fact the duration of the hauls was on the average about 2 hrs. The midpoint between the time of shooting and that of hauling was estimated and all hauls with the midpoint within a two-hour period were averaged.

Plaice

All graphs indicate that the catches during the day-time are greater than those at night, however, sometimes the difference is not very great. The catch of the first haul after sunset was for the first six months about 17% greater than the day-time average catch. For the following months this phenomenon disappears and reappears slightly in November-December, about 5%.

Dab

All graphs indicate that the catches during the day-time are slightly greater than those at night, however, sometimes, especially from July to November, there is

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hardly any difference between night and day catches. The catch of the first haul after sunset for the months of March to September is about 17% larger than the average day-time catch.

Sole

All graphs show that the diurnal variation in the catch is distinctly marked throughout the year. Night catches are about 2-6 times greater than the day catch. The catches in winter time (16 hrs dark) are 40% higher than the catches in summer time (8 hrs dark). The highest catches are always in the middle of the night.

Discussion

The data given in Figure 1 confirm the view of all previous authors on the diurnal variation in catches of plaice, dab and sole, based on catches of research vessels, in the southern North Sea. (Boerema, de Groot, Hempel, Woodhead, 1964). The diurnal variation in the catch of plaice and dab in the northern part of the North Sea is completely different, here we get a reversed picture. (Parrish, Blaxter and Hall, 1964). Data are lacking on sole in the northern part of the North Sea, because the northern boundary of the sole on the English coast is about 55°30'N. The data on the diurnal catch variation of plaice and dab given in Figure 1 are very much the same. There is a tendency of a slightly smaller night catch. However, the first catch after sunset is on the average a little higher than the average day catch. The diurnal variation in the catch of sole is very clear throughout the year. The night catches in winter time are about 40% higher than in summer time. This is due to the fact that the nights are shorter in summer. Table 2 gives the catch of plaice and sole in kgs per 100 fishing hours in 1960 in the rectangles investigated (J 5, 6; K 6). We observed that the catch of plaice fluctuates irregularly throughout the year. The catches of sole, however, decrease from January to August (exception April) and increase from August to December. In April there is a migration of sole through the area studied towards the spawning grounds in Danish waters. The high catches in November and December originate in the strong sole year-class of 1958 which came into the fishery. Boerema (1964) gives the same annual variation in the catch of sole for the years 1954 and 1955. In more recent years (1966) perhaps due to the explosive way of using beam trawls instead of otter trawls, the annual variation in the catch of sole has disappeared. Table 3 gives the catch in kgs per 100 fishing hours of sole in 1966 in the rectangles investigated. In the Netherlands the total landings of sole increased enormously from 1960, 9,274,000 kgs to 1966, 25,192,000 kgs. This is partly due to strong year-classes, but also to the more efficient fishing gear.

Summary

1. The diurnal variations in the catch of plaice, dab and sole of the commercial cutter UK 81, for the years 1959-60 were investigated.

2. The data are presented in Figure 1 and Table 2.

3. The data on the diurnal variation in the catch of plaice and dab are much the same. There is a tendency of a slightly smaller night catch.

4. The first catch of plaice and dab after sunset is on the average a little higher than the average night catch (about 9%).

5. The diurnal variation in the catch of sole is very clear throughout the year.

6. Night catches of sole are about 2-6 times larger than day catches.

7. The catches of sole in winter time are about 40% higher than in summer time. This is closely correlated with the dark period.

8. There is a marked annual variation in the catch of sole; the annual variation in the catch of plaice is less marked (Table 2).

9. The annual variation of sole catches in the years 1960 and before, is lacking in 1966 due to the rapidly developing beam trawling (Tables 2 and 3).

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PLAICE

Hour	J.F.	M.A.	M.J.	J.A.	S.O.	N.D.
13	96	124	94	108	92	108
15	104	122	122	110	82	134
17	136	116	86	104	108	122
19	90	134	86	118	92	96
21	86	88	104	86	76	102
23	88	58	76	86	94	66
1	80	66	76	96	78	54
3	74	56	84	84	82	84
5	104	84	104	104	86	64
7	106	106	96	104	90	92
9	112	112	110	90	106	102
11	104	118	82	102	114	120

DAB

J.F.	M.A.	M.J.	J.A.	S.O.	N.D.
156	102	108	92	100	100
128	104	104	90	100	128
66	108	96	96	102	100
124	118	70	92	100	104
98	90	116	106	100	128
90	76	100	96	100	112
96	74	104	90	94	90
88	72	100	90	112	128
54	86	86	96	92	70
60	84	94	96	84	54
64	96	108	90	94	88
100	100	76	88	90	94

SOLE

J.F.	M.A.	M.J.	J.A.	S.O.	N.D.
38	44	46	48	26	58
34	38	50	36	24	72
62	76	62	62	44	104
104	56	130	42	112	108
124	82	148	126	146	102
114	146	140	170	144	112
152	150	164	152	142	126
114	96	130	156	142	122
110	72	98	106	140	94
60	46	42	70	62	92
62	26	52	52	42	90
52	40	28	34	42	64

Table 1

The percentages of the average relative catch of plaice, dab and sole for the years 1959 and 1960 in the rectangles J5, J6, K6, data collected by the commercial cutter UK 81.

	PLAICE		SOLE	
Jan.	6896	16124	4497	7672
Febr.	9228		3175	
Mar.	6504	12055	2474	6075
Apr.	5551		3602	
May	6638	16249	3069	5994
Jun.	9611		2925	
Jul.	9792	18647	2603	5216
Aug.	8855		2613	
Sep.	8963	16947	2918	8497
Oct.	7984		5579	
Nov.	7496	10872	6928	12976
Dec.	3376		6048	

Table 2

Catch in kgs. per 100 fishing hours of plaice and sole in 1960, in the rectangles J5, J6, K6. (data collected by Statictical Dept. Ministry of Agriculture and Fisheries).

	OTTERTRAWL		BEAMTRAWL	
Jan.	3666	5853	9264	16527
Febr.	2187		7263	
Mar.	2393	4156	8874	15498
Apr.	1763		6624	
May	4393	6520	13413	25455
Jun.	2127		12042	
Jul.	2207	6405	21223	33589
Aug.	4198		12366	
Sep.	5197	10894	14133	31491
Oct.	5697		17358	
Nov.	5724	11943	13954	26718
Dec.	6219		12764	

Table 3

Catch in kgs. per 100 fishing hours of sole in 1966, in the rectangles J5, J6, K6 (data collected by Statistical Dept. Ministry of Agriculture and Fisheries).

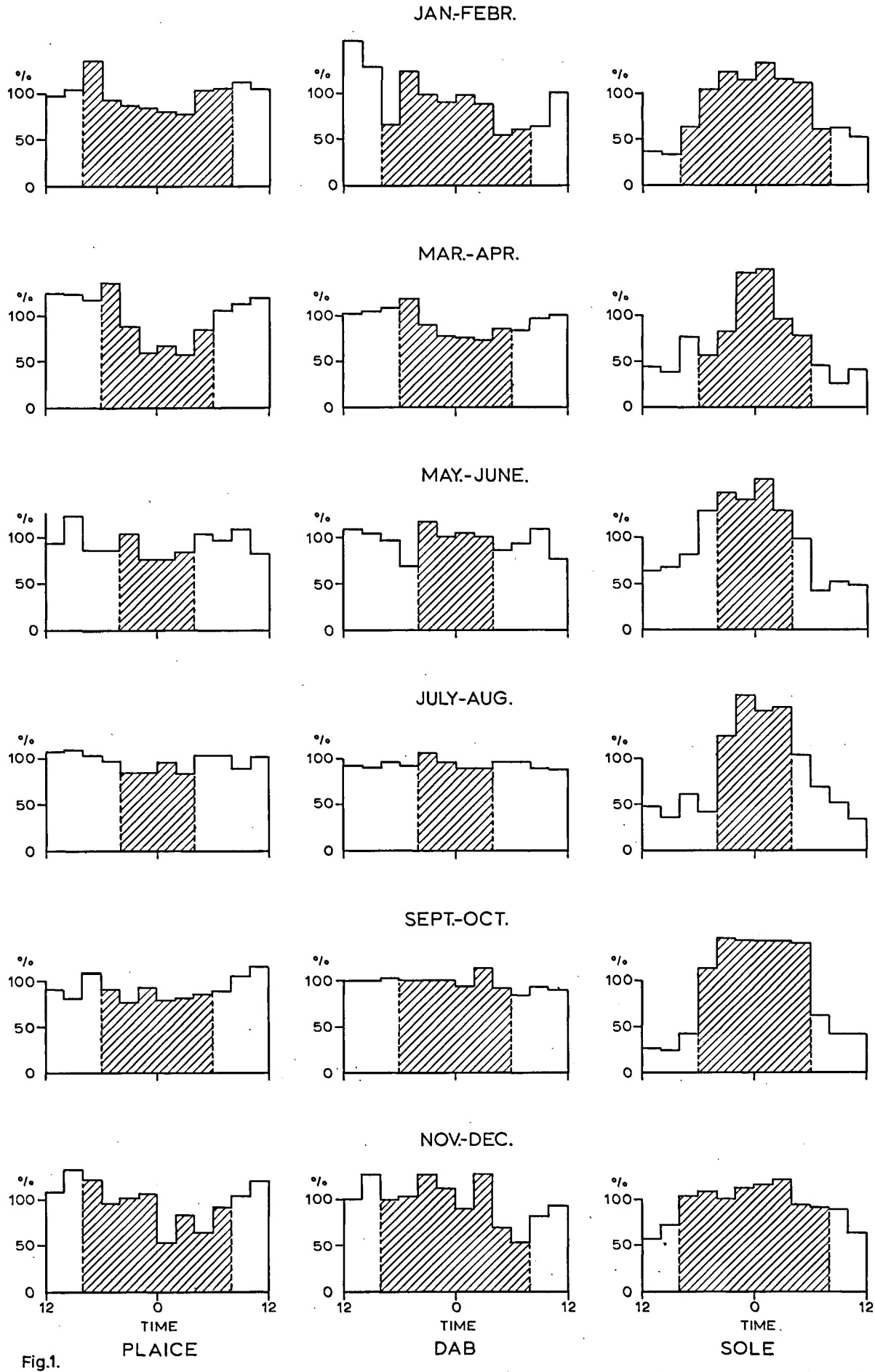

Fig.1.
Diurnal changes in trawl catches of plaice, dab and sole in the North Sea in the years 1959, 1960. Data collected by the commercial cutter UK 81