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Selectivity of Bottom Trawls During The Fishery For
Redfish on the Flemish Cap Bank

by

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ABSTRACT

Results of determination of selectivity of trawl sacks with mesh size of 126 and 137 mm under the fishery of deepwater redfish (*Sebastes mentella*) on the Flemish Cape bank in June-July, 1993. Losses from change to fishery of deepwater redfish by trawls with larger mesh size are estimated. Unprofitability of change to fishery of deepwater redfish by trawls with 125-130 mm mesh is proved, and the change to 100 mm mesh size is recommended.

INTRODUCTION

At present, deepwater redfish is the target species in the fishery on the Flemish Cape bank (3M Division). Due to preliminary data, total catch of all countries in 1992 constituted 33 thou. t. In 1993, total stock of deepwater redfish in this area constituted, due to the trawl acoustic survey, 390 thou.t, and biomass was estimated as 1.4 times higher the long-term mean level for 1989-1993.

Till June, 1, 1994, the new measure of management for deepwater redfish can be introduced in the NAFO area which is the transfer from 120 mm mesh size to 130 mm (FC Doc.92/14, part V, shedule IV).

During the determination of the optimal mesh.size in the trawl sacks in the redfish fishery, there are some problems connected with the absence of data on survival of fish which go out of the trawl sack in the process of trawling and lifting the trawl, as well as on minimal fishery measure for this species.

Some authors advise to accept the minimum fishery measure from 23 to 25 cm (Sterkhova et al., 1977 and 1979). Accounting many factors, K.G. Konstantinov et al. recommend to fish redfish in the Barents and Norwegian Seas by trawls with mesh size not more than 100 mm (Konstantinov et al., 1983).

The proposals not to enlarge the minimum mesh size during fishery of deepwater redfish on the Flemish Cape bank are given on the basis of investigations conducted by PINRO.

MATERIAL AND METHODS

Experimental works were conducted by R/V "Vilnius" in June-July, 1993. The standard trawl 41.7/39.6 m with vertical opening of 6.2-6.5 m and opening in wings of 24.0-26.0 m was used during the investigations. The gear were similar to those in commercial fishery. The hauls were done at 3.5 knots of speed and 30-60 min. prolongation.

Selectivity of trawl sacks was checked by the method of their coverage by the fish-catcher. During the investigations the fish-catcher of the sack-shape was used, which covered the trawl sack from all sides. Perimeter of the fish-catcher was 40% larger than that of the trawl sack. The forward edge of fish-catcher was fastened to the cone part of the trawl sack 6 m from the beginning of the cylindrical part, whereas the back side came forward for 5 m out of codend. Sides of coverage of the fish-catcher were 0.4-0.5 m from the codend. Fish-catcher was made of the polyamid net with 3.1 mm diameter and result linear density of 5.7 RTex, the mesh size - 55 mm.

Codends of polyamid nets and linear density of 2 x 5.7 RTex and actual mesh sizes of 126 and 137 mm were investigated. Mesh size was determined by the ICNAF plate of 2 mm thickness.

Codends were used before the investigations, and their mesh has stabilized.

Fish from the sack and fish-catcher were measured and calculated separately. At small catches, the length of every fish was measured, at large ones - only the representable part of catches was measured, the rest one was calculated.

Momentary losses were determined by comparison of catches by trawl sacks using the coefficient of deduction of some length groups.

RESULTS

17 comparative trawlings were conducted. Their characteristics are presented in Table 1, and results - in Tables 2 and 3. Catch sizes fluctuated from 200 to 2.500 kg. In areas which were caught over fish of two length groups predominated - 25 and 30 cm. Concerning the physiology, the majority of fish

was immature or prespawning (80% of males and 95% of females). Working by codends of both 126 and 137 mm meshes, the caught concentrations of redfish were similar in length, that corresponded to the conditions of the experiment (Fig. 1).

Length composition of fish kept or separated by trawl codends with 126 and 137 mm mesh sizes is in Table 2 and 3 and in Fig. 2.

Results of selectivity determination are presented in Tables 2 and 3. By these results, the curves of selectivity are done and their main parameters are obtained:

for 126 mm mesh - $K_s = 2.9$ $d_s = 5.6$ cm 150% = 36.0 cm
for 137 mm mesh - $K_s = 2.9$ $d_s = 4.3$ cm 150% = 39.3 cm.

Codend of 126 mm mesh size separated 87%, and that of 137 mm - 97% of fish. Biomass losses constituted 83.0 and 94.5%, correspondingly.

DISCUSSION

The obtained results in selectivity correspond completely to that published earlier (Konstantinov et al., 1982 and 1983). A large part of fish is actually separated from the trawl sack during catching. Only redfish of more than 39 cm do not go out of sack with mesh size of 126 mm, and 41 cm fish - of 137 mm mesh. The number of fish of such length is insufficient. The majority of separated fish is 22-32 cm long at the age of more than 8, and they constitute the base of the fishery on deepwater redfish on the Flemish Cape bank at present. As K.G. Konstantinov et al. (1983) have shown, 65% of fish of such length are separated at the mesh size of 98 mm and 95% - at 135 mm. In our case, separation of fish of such length constituted 97%. We can note in general that new data on selectivity correspond completely to those obtained earlier by PINRO. It allows to prove the recommendation to change mesh size to 100 mm during trawl fishery on deepwater redfish.

In the case of enlargement of mesh size to 130 mm, the fishery of deepwater redfish on the Flemish Cape bank will not be effective, since nearly the total number of fish will be separated. In further investigations, it is necessary to determine the trawl selectivity at 100 mm mesh size during the on redfish and other commercial species, as well as to conduct the specialized works on estimation of survival of fish gone through the mesh.

Table 1. Characteristics of comparative trawlings in sites of concentrations of deepwater redfish in the area of Flemish Cape bank, June-July, 1993.

Data	:No. : :of : :trawl:	:Position:	:Depth: m	:Trawling :period, : hrs., min.:	:Mesh: mm	Yield			
						: Codend	: Catcher	spec.: M, kg	spec.: M, kg
28.06	268	46°31' N 45°40' W	310	18.50-19.50	I35	88	43	2263	705
"	269	46°30' 45°39'	315	21.50-22.50	"	31	19	1842	453
29.06	270	46°30' 45°35'	330	01.40-02.40	"	33	18	2300	551
"	271	46°31' 45°40'	325	05.50-06.40	"	141	58	2394	712
"	272	46°31' 45°37'	320	08.50-09.50	"	36	19	2813	660
"	273	46°31' 45°36'	315	14.45-15.45	I25	261	95	832	161
"	274	46°30' 45°41'	325	17.35-18.25	"	31	10	913	160
"	275	46°30' 45°35'	320	19.40-20.40	"	75	30	649	176
"	276	46°30' 45°40'	320	22.10-23.10	"	16	7	1160	258
30.06	277	46°31' 45°35'	320	05.30-06.30	"	86	38	1474	435
08.07	342	46°43' 44°14'	340	09.30-10.30	"	1021	444	6512	2077
"	343	46°42' 44°13'	340	14.05-14.35	"	430	207	2368	777
"	344	46°44' 44°13'	340	16.40-17.10	"	751	334	4012	1238
"	345	46°42' 44°13'	340	19.10-19.40	"	195	84	1184	327
"	346	46°44' 44°11'	340	21.20-21.50	"	82	36	1118	347
09.07	347	46°44'	340	08.20-08.50	I35	87	48	3110	976
	348	46°44' 44°11'	340	15.25-15.55	"	141	72	2411	778

Table 2. Results of determination of selectivity of trawl codend with mesh of 126 mm related to deepwater redfish on the Flemish Cape bank in June-July, 1993.

Length, cm	Yield			Selectivity		
	Codend, spec.	Catcher, spec.	Total specimens	%	S%	Sb%
14		5	5			
15		10	10	+		
16		62	62	+		
17		88	88	0,3		
18		93	93	0,4		
19		147	147	0,4		
20		295	295	0,6		
21	2	489	491	1,3	0,0	0,1
22	29	1154	1163	2,1	0,4	0,4
23	28	1130	1158	5,0	0,8	1,2
24	34	1325	1359	5,0	2,4	1,9
25	82	2086	2168	5,9	2,5	2,9
26	103	1665	1768	9,4	3,8	4,0
27	77	1063	1140	7,6	5,8	5,5
28	112	1387	1499	4,9	6,8	6,7
29	167	1411	1578	6,5	7,5	8,3
30	426	2568	2994	6,8	10,6	10,8
31	289	1704	1993	12,9	14,2	13,1
32	433	1702	2135	8,6	14,5	16,3
33	352	911	1263	9,2	20,3	20,9
34	246	365	611	5,5	27,9	29,5
35	207	293	500	2,6	40,3	36,5
36	125	105	230	2,2	41,4	45,3
37	124	135	259	1,0	54,3	47,9
38	44	29	73	1,1	47,8	54,2
39	30		30	0,3	60,3	69,4
40	28		28	0,1	100,0	86,8
41	15		15	0,1	100,0	100,0
42	8		8	0,1	100,0	100,0
43	7		7	+	100,0	100,0
Σ	2948	20222	23170	100		
M kg	1285	6156	7441			

Table 3. Results of determination of selectivity of trawl codend with 137 mm mesh related to the deepwater redfish fishery on the Flemish Cape bank in June-July, 1993.

Length, cm	Yield				Selectivity	
	Codend: spec.	Catcher: spec.	Total specimens	%	S%	Sb%
14		7	7			
15		15	15	+		
16		60	60	0,1		
17		142	142	0,3		
18		85	85	0,8		
19		158	158	0,5		
20		251	251	0,9		
21		459	459	1,4		
22		881	881	2,6		
23		1016	1016	5,0		
24	2	1275	1277	5,7	0,0	0,1
25	9	1960	1969	7,2	0,0	0,2
26	8	1495	1503	11,1	0,0	0,4
27	10	1365	1375	8,5	0,0	0,6
28	28	1191	1219	7,8	0,0	1,2
29	39	1319	1358	6,7	2,2	2,0
30	46	1723	1769	7,8	2,2	2,6
31	49	1290	1339	10,0	2,6	3,1
32	84	1198	1282	7,6	3,7	4,3
33	46	500	546	7,2	6,6	6,2
34	47	305	352	3,1	8,4	9,5
35	43	176	219	2,0	13,4	13,8
36	36	110	146	1,2	19,6	19,2
37	32	74	106	0,8	24,7	24,8
38	16	22	38	0,6	30,2	32,3
39	22	35	57	0,2	42,1	37,0
40	15	21	36	0,3	38,6	40,8
41	13		13	0,2	41,7	60,1
42	7		7	0,1	100,0	80,6
43	3		3	+	100,0	100,0
44	1		1	+	100,0	100,0
46	1		1	+	100,0	100,0
Σ	557	17133	17690	100		
M kg	277	4835	5112			

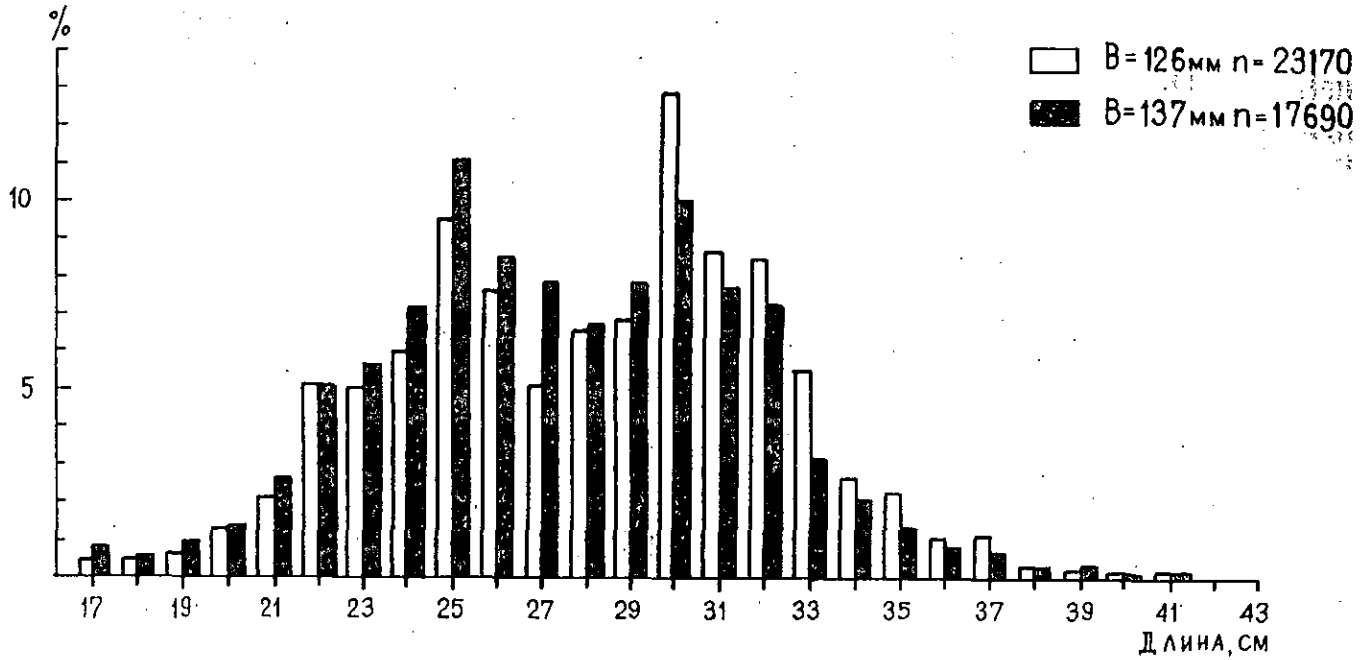


Fig. 1. Length composition of deepwater redfish (codend and catcher together) at 126 and 137 mm meshes on the Flemish Cape in June-July, 1993,

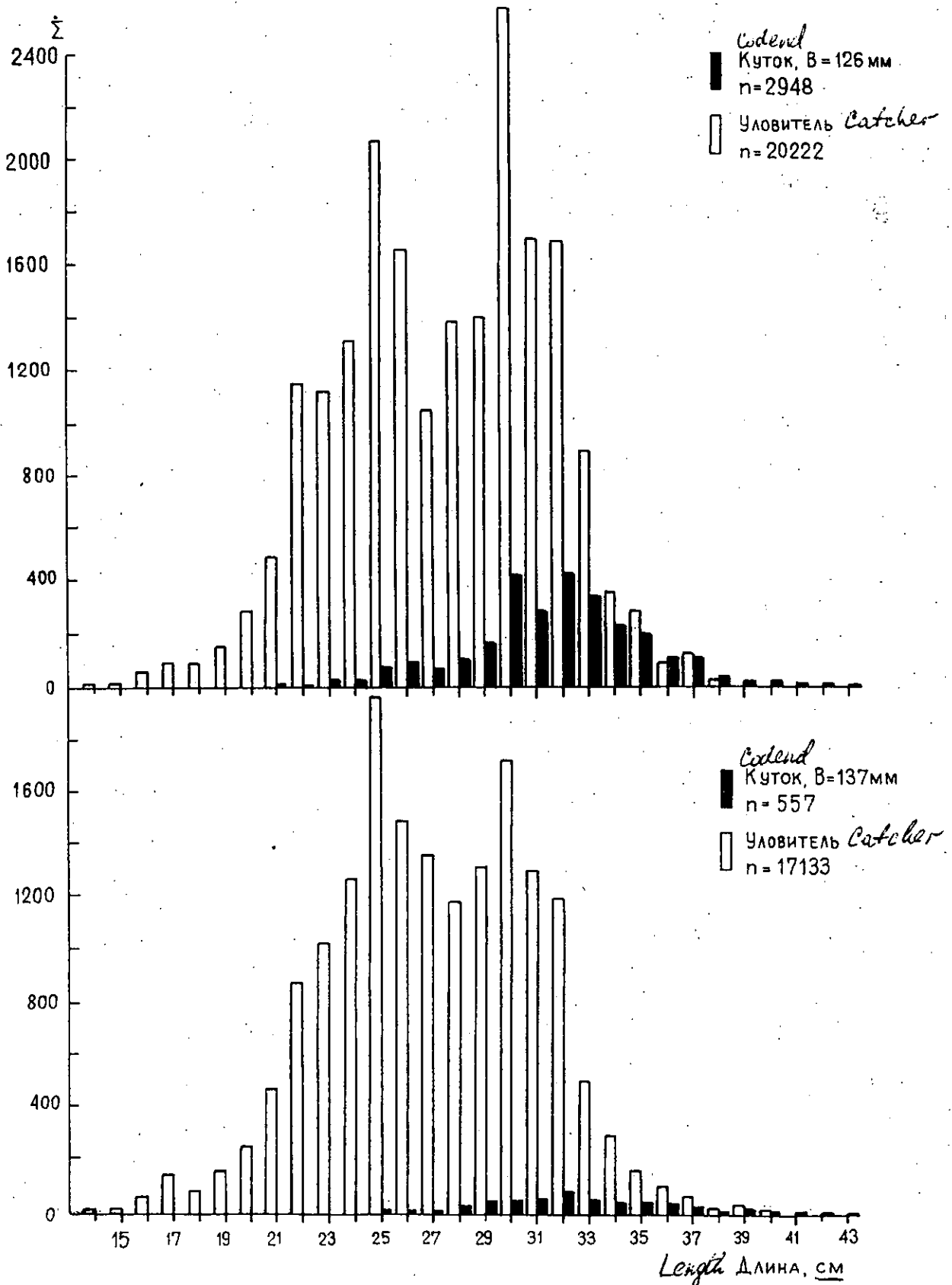


Fig. 2. Length composition of deepwater redfish both kept and separated by the codend with 126 and 137 mm meshes on the Flemish Cape in June-July, 1993.

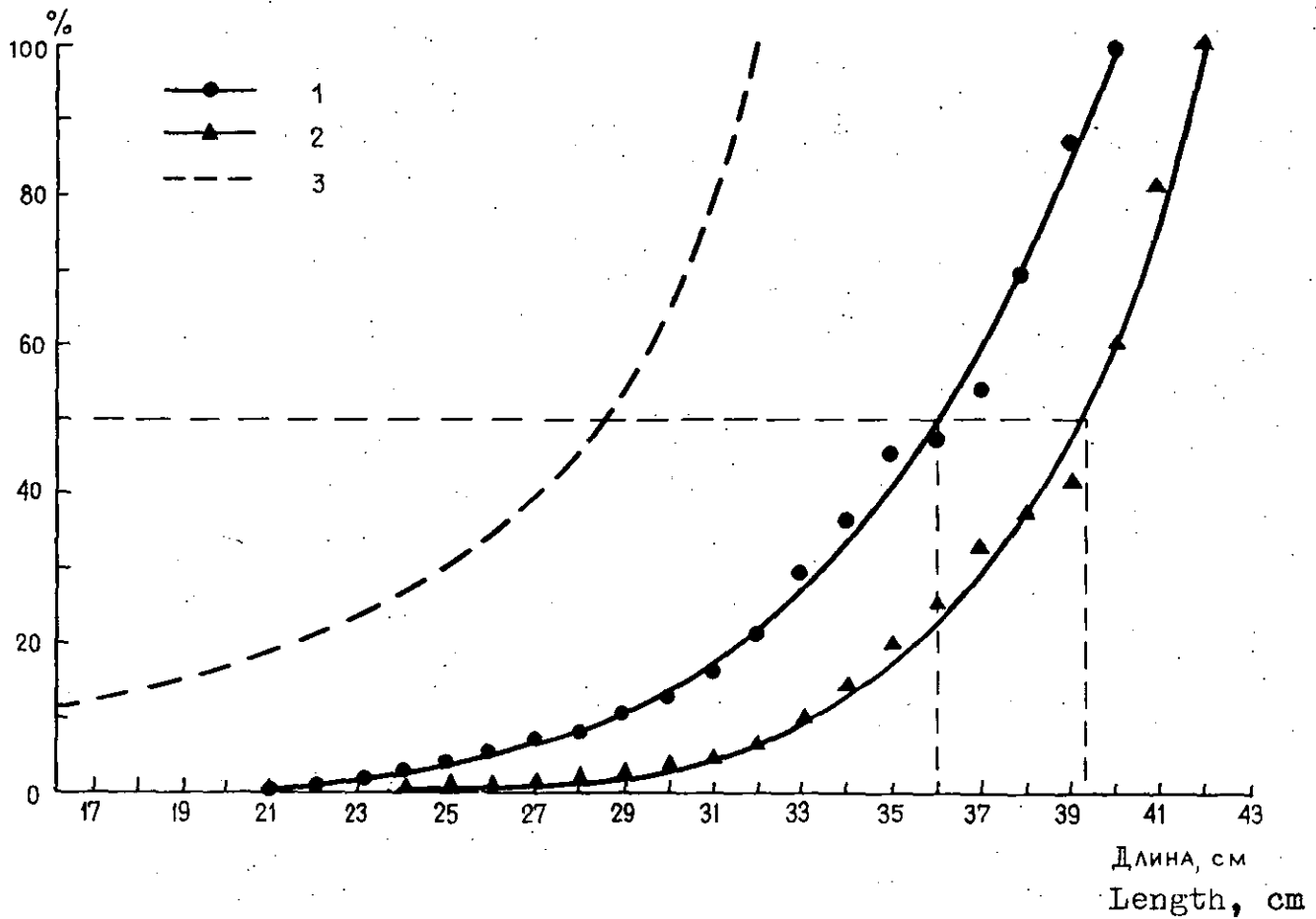


Fig. 3. Curves of selectivity of trawl codends with 126 mm mesh (1), 137 mm (2) and 100 mm (3) related to deepwater reifish on the Flemish Cape in June-July 1993 (the curve is built with the $K_s = 2.9$ due to theoretical data).