Lieber Harald, unbedingt mich mitbringen!

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Anadromous and Catadromous Fish Committee

On the eelfishery of the Federal Republic of Germany in the German Bight

by

E. Aker and H. Koops
Institut für Küsten- und Binnenfischerei der Bundesforschungsanstalt für Fischerei, Hamburg
2000 Hamburg 50, Palmaille 9

General history

There is a long established fishery on eels in the estuaries of the coast to catch small eels for stocking inland waters. Yields did not surpass 40 metric tons. But there were also catches of large eels for human consumption taken as the small eels by traps or by stowe nets.

With the introduction of a special eel trawl by German fishermen from the Baltic in 1964 the catches of eels increased in the following years to above 250 tons and had reached a peak with some 375 tons in 1971 (Table 1).

Fishing gear

The eel trawl introduced was formerly used in the southern Baltic off the Pommeranean coast. With growing experience the gear was accordingly adjusted from year to year to the North Sea conditions. A typical otterboard eel trawl as used in 1972 is given in Fig. 1.

In 1973 a pair trawl was developed at the Institut für Küsten- und Binnenfischerei which allows bottom as well as pelagic trawling. A description of the net is given in Fig. 2. First experimental fishing trials are most promising. As Table 2 shows, pelagic and

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bottom trawling with this multipurpose net were of the same magnitude with the difference that the pelagic catches consisted to 55% of silver eels against 18% in the bottom trawling experiments. A total of 152 pelagic trawling hours were compared with 70 bottom trawling hours. Pelagic trawling brought on an average a eel catch of 18 kg/h and bottom trawling 17.5 kg/h.

Fishing fleet

Coastal and high sea cutters are seasonally employed in this eel fishery. Sizes of fishing boats are mostly between 16-24 m, engines used between 150-250 HP. In 1973, 39 fishing boats were engaged in eel fishing, 17 of these using Büsum as home base, the rest fishing from Cuxhaven, Bremerhaven and some other places. Eels are fished by the cutters alternatively to cod and flatfish depending on season and economic yields possible. Each fishing boat is equipped with running water containers to keep the eels alive. At landing places aerated storage tanks for the life fish storage are available.

Fishing grounds

From 1968-1973 9 research cruises were conducted by the Institut für Küsten- und Binnenfischerei, which were to study the distribution of eels in the fishing area and the composition of catches and to carry out several tagging experiments for the evaluation of the fish migration on the fishing grounds etc. From the surveys it can be concluded that the richest fishing grounds are south and south east to Helgoland at depth from 12-45 m. In the hatched areas of Fig. 3 catches per hour were above 13 kg and up to 43 kg. In September 1970 a new fishing ground could be found north of the islands of Langeoog and Spiekeroog (53^{o} 46'N, 10-7^{o} 30'E) at depth from 7-18 m which brought average catches of 8 kg/h.

In late autumn good catches can be made 5-6 n.m. SSW of Helgoland in the so called "Hamburger Loch" at depths from 37-45 m where relatively high temperatures can be found even up to November. The area is one of the places at which the eel is "hibernating".

Catches

The fishing season starts during the middle of May and terminates at about the middle of November. From July-October nearly 80% of the catches are taken, more than 50% alone during August and September. (Table 3).

When looking to the August-September data 1970-1973 of Table 4, it is astonishing that the catches per unit of effort were with 11-16 kg/h so constant during these 4 years.

Eel landings from the trawl fishery in the German Bight value at approximately 2.5 Million German Marks per annum in recent years. Since 1967 eel catches made from the German Bight have surpassed those from the Belt Sea and Baltic which were until then the main fishing area for the German eel fishery in the sea (Table 1). Eel fishing can be very profitable.

Size composition of catches

After systematic trawl fishing for eels was introduced in 1964 the percentage of bigger eels in the catches went up considerably. 1963 54.1% of the eels were above 125 g, 1964 = 69.9%, 1965 = 77.0% and 1966 = 83.1%. As expected there was no decline in the catch of small eels used for stocking of inland waters when eelfishing with trawls developed.

The size composition of the eel catches are given in table 5 and 6 resp. Fig. 4 . The highest percentage of small eels has been found in the brackish water zone of the Eider because male eels, which rarely grow to more than 35-40 cm, dominate in the estuaries. Catches of eels from the freshwater part of the river and even more those from the German Bight have a higher percentage of bigger eels. An influence of different selectivity of year (traps and stowe-nets in the river fishery, trawls in the German Bight) cannot be excluded. For the German Bight a slight increase for the average length could be observed from 1968 to 1972 (Table 6).

Most of the eels are brown eels during summer, the number of

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silver eels increases in autumn.

Results of tagging experiments

From 1968 to 1973 a total of 14,648 eels were tagged. Results are already published (Aker and Koops, 1973) and can be summarized here.

Arrow tags made from thin plastic sheet gave considerably lower return rates than tags in form of plastic plates fixed with perlon yarn. Losses of tags are considerable and increase with time. In eels of less than 40 cm the loss of tags increases with decreasing size. For eels in the rivers Elbe and Eider living upstreams the tidal area no migration into coastal waters was observed.

Most of the eels in the tidal area of the river Eider stay in the river, only few were recaptured in coastal waters.

The part of the river Eider just above the Nordfeld-dam is a preferred area for hibernation both for eels, which live during summer either upstreams or downstreams.

Part of those eels being found in the shallow parts of the sea at Büsum during summer are moving towards more deeper and distant areas in late autumn, other enter rivers. Rivers being located southward are preferred.

In autumn the Büsum-fishing-grounds are passed by eels migrating northward to the river Eider.

Rivers are preferred for overwintering by those eels which live nearer to coast in summer while eels living more off-shore are tending to hibernate in deeper waters near the isle of Helgoland.

Large-sized eels increase in number with distance from the coast. Eels transplanted from rivers into the sea returned to freshwater, but not necessarily to the same rivers. No homing was observed in eels brought from the sea into freshwater.

The eels in the German Bight obviously are more or less vagabonding; yet a homing tendency can be observed when transplanting eels from shallow areas near the coast to more distant areas and vice versa.

In the river Eider nearly 50% of the eel-population are caught annually. Eels of marketable size are fished by 30% in the Büsum-area and by 20% in the more off-shore areas.

Summary

Since 1964 eels are fished in the German Bight by trawl fishing. The catches increased from 160 tons to more than 300 tons. Fishing vessels are mostly fishing cutters between 16-24 m with engines between 150-250 H.P.. The eels are fished at depths from 10-50 m from May to November. Summer catches are brown eels, the number of silver eels increases with the end of the season. Most of the eels caught belong to market groups II and I (more than 125 g resp. 44 cm).

References

Aker, E. and Koops, H.: Untersuchungen über Aalbestände in der Deutschen Bucht. Arch.Fisch.Wiss. 24, 1-3, 19-39, 1973

Pape, A.: Die Kleine Hochsee- und Küstenfischerei Schleswig-Holsteins im Jahre 1971. Fischerblatt, 5 (20), 93-106, 1972

Table 1: Eel landings from the coastal fishery of the Federal Republic of Germany 1960 - 1973 in 1 000 kg [1]

year	small eels for stocking, North Sea Coast [2]	eels for consumption North Sea [3]		Total North Sea	Belt Sea and Baltic
		eel III	eel II + I		
1960	18.5	81.0	90.8	171.8	263.5
1961	11.4	77.7	92.3	170.0	273.1
1962	15.1	75.7	84.7	160.4	244.2
1963	25.5	68.0	80.1	148.1	345.3
1964	17.0	44.8	104.1	148.9	275.1
1965	24.0	39.8	133.4	173.2	202.0
1966	26.7	39.4	193.6	233.0	242.5
1967	31.7			336.6	249.8
1968	29.5			330.7	234.3
1969	22.2			280.0	204.4
1970	25.0			296.1	143.9
1971	22.5			374.5	124.6
1972	35.7			243.1	146.3

1) As given by official statistics

2) Undersized eels, average weight about 20 g, caught for stocking of rivers and lakes

3) Market groups: eel III = 55 - 125 g (ca. 35 - 44 cm)
eel II = 125 - 250 g (45 - 54 cm)
eel I = > 250 g (> 54 cm)

Table 2: Experimental eel-catches in the German Bight made by a pair trawl for pelagic and bottom trawling during September/October 1973

month	pelagic trawling				bottom trawling			
	total catch kg	kg/h	number of hauls	number of hours fished	total catch kg	kg/h	number of hauls	number of hours fished
Sept./Oct.	1 065	19.7	14	54	255	13.9	5	18.3
October	870	16.8	12	51.5	405	20.8	6	19.5
October	823.5	17.6	12	46.9	560	17.5	8	32
	2 758.5	18.1	38	152.4	1 220	17.5	19	69.8

Table 3: Catch per month in % of total catch per year, average 1965-1971 (after PAPE)

month	I-IV	V	VI	VII	VIII	IX	X	XI	XII
%	0.4	2.0	7.5	15.4	22.5	30.0	18.8	3.3	<0.1

Table 4: Experimental eel catches in the German Bight
(n 1 = number of fishing hours; n 2 = number of hauls)

vessel	date	catch per hour in kg	n 1	n 2	size category (%) 1)			
					I[2)]	II[2)]	III[2)]	small eels
RV "Uthörn"	June-July 68	7.3	32.3	24	3.8	22.7	53.6	19.9
RV "Friedrich Heincke"	December 69	4.5	3	3	34.2	36.9	21.0	7.9
FC "Frieda"	Septemb. 70	12.5	21	9	10.5	20.7	40.9	27.9
RV "Friedrich Heincke"	November 70	11.1	8.5	17	13.0	33.0	44.3	9.7
RV "Friedrich Heincke"	Septemb. 71	11.1	39	41	11.6	27.2	46.3	14.9
RV "Friedrich Heincke"	July 72	22.8	15.5	16	7.3	36.8	44.8	11.1
RV "Friedrich Heincke"	Septemb. 72	11.7	62	62	13.1	29.1	44.7	12.4
RV "Friedrich Heincke"	August-Septemb. 73	16	42.1	34	9.3	19.9	41.4	29.4
RV "Friedrich Heincke"	October-November 73	2.5	12.5	10	34.7	25.3	19.6	20.4

1) % of total number of eels caught

2) eel I : > 54 cm (250 g)
eel II : over 45-54 cm (125 g - 250 g)
eel III : over 35-44 cm (55 g - 125 g)
small eels: < 34 cm (< 55 g)

Table 5: Length-distribution of eel-catches (in %) from different catchment areas

Size group cm	Middle part of river Eider 1) VI 68	Eider-down-streams of the Nordfeld-dam 2) VI 68	Off Büsum and Elbe-Esbjerg-Way (To.EE 1-EE 2) 3) VI-VIII 68	S to SW Helgoland 3) VIII 68 IX 71	River Elbe ca. 220 km upstreams (Gorleben) 4) VII 69
< 20					
20 - 24	0.1		0.0	0.1	
25 - 29	3.3	3.5	1.6	1.3	
30 - 34	25.6	49.7	17.3	12.2	5.5
34 - 39	40.1	33.4	30.2	27.6	26.2
40 - 44	11.0	7.0	24.2	24.2	29.0
45 - 49	6.8	2.9	15.7	17.3	17.5
50 - 54	6.3	1.2	7.3	8.9	8.2
55 - 59	4.3	0.3	2.8	5.6	9.2
60 - 64	0.9	1.5	0.8	2.3	1.6
65 - 69	1.3	0.6	0.2	0.6	1.6
70 - 74	0.4		0.0	0.1	1.1
> 74					
n	522	344	3 035	2 311	183
$\bar{x}$	39.7	36.1	41.2	42.9	44.8

1) River to the North Sea, north of Büsum, stowe-net (Hamen) and fyke net catches
2) Tidal area, brakish water
3) Trawl fishing
4) River fishery with otterboard stowe-net (Scherbrett-Hamen)

Table 6: Length distribution of eels from experimental catches in the German Bight 1968 and 1970 - 1972

cm	1968	1970	1971	1972
14	-	-	-	0.01
16	-	-	-	0.01
18	-	-	-	0.01
20	-	-	-	-
22	0.01	0.14	0.03	0.05
24	0.02	0.72	0.07	0.18
26	0.24	1.73	0.43	0.30
28	1.03	3.35	1.22	0.84
30	2.83	5.90	2.74	2.72
32	6.01	7.52	5.15	6.48
34	9.86	6.95	8.01	8.83
36	12.01	6.73	10.42	7.92
38	12.22	8.23	11.15	8.31
40	11.47	9.41	10.43	9.77
42	9.87	8.45	9.47	8.81
44	8.44	6.23	8.54	7.28
46	7.47	5.00	7.72	6.62
48	6.34	5.02	6.52	5.92
50	4.95	4.72	4.99	5.28
52	3.23	3.92	4.09	4.50
54	1.69	3.54	3.58	3.82
56	0.87	3.65	2.71	3.35
58	0.57	3.56	1.71	2.81
60	0.43	2.61	1.12	2.44
62	0.25	1.37	0.89	1.72
64	0.08	0.72	0.72	0.99
66	0.04	0.36	0.40	0.57
68	0.04	0.11	0.12	0.24
70	0.02	0.06	0.05	0.11
72	-	0.03	0.04	0.07
74	-	-	0.01	0.04
76	-	-	-	0.02
78	-	-	-	0.02
80	-	-	-	0.01
82	-	-	-	0.01

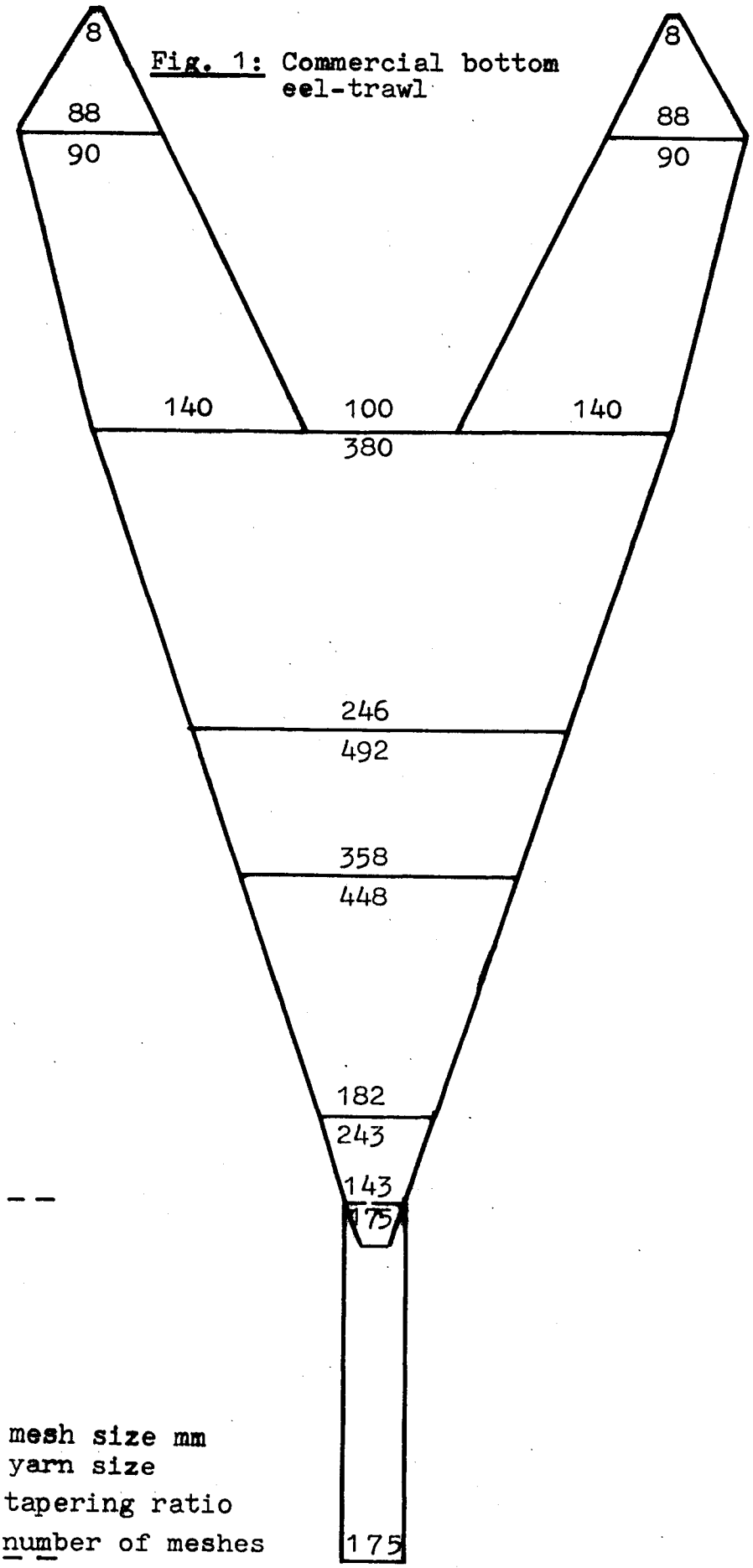
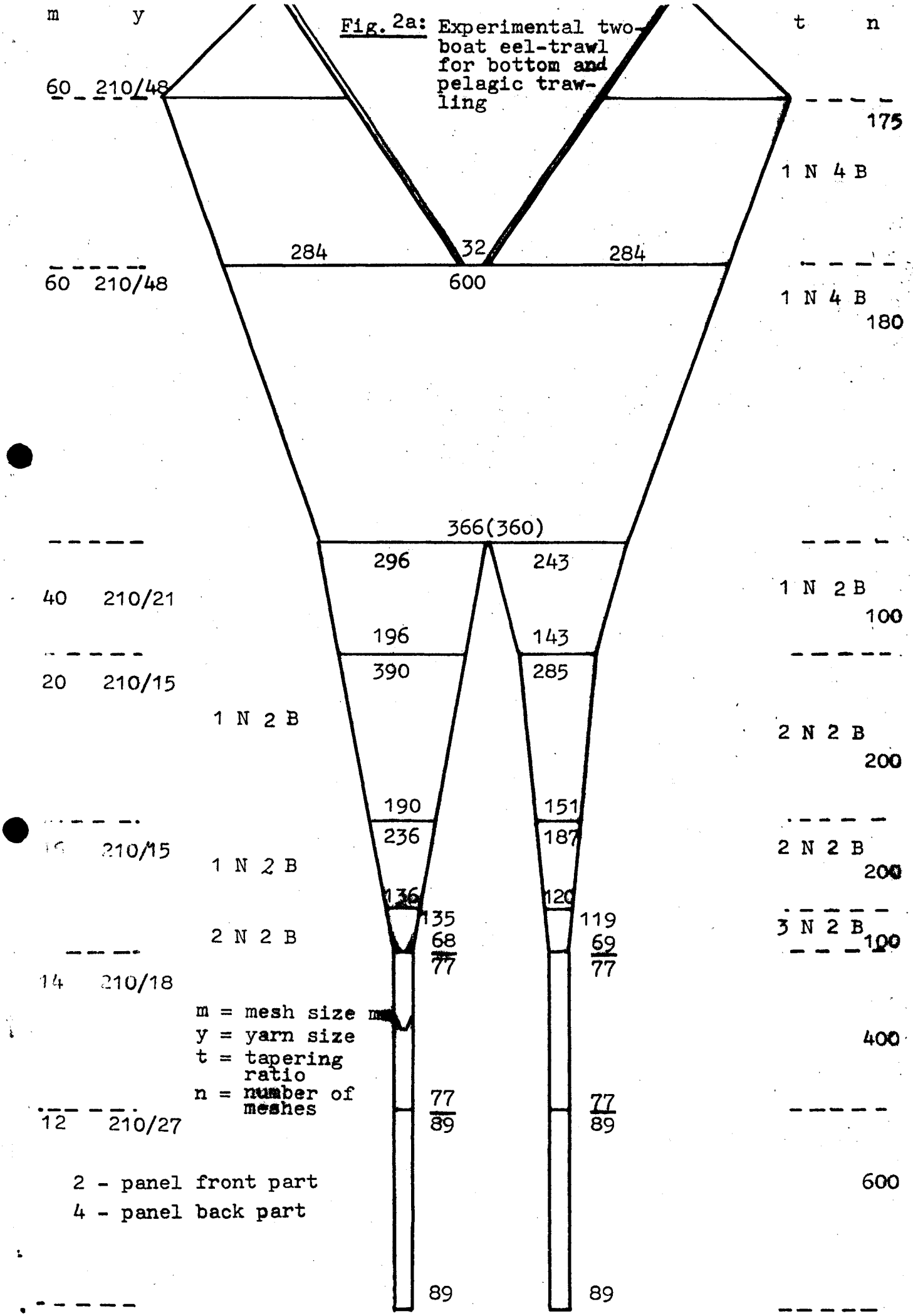


Fig. 1: Commercial bottom eel-trawl


m y
t n
Fig. 2a: Experimental two-boat eel-trawl for bottom and pelagic trawling
60 210/48
175
1 N 4 B
284
32
284
60 210/48
600
1 N 4 B
180
366(360)
296
243
40 210/21
1 N 2 B
100
196
143
20 210/15
390
285
1 N 2 B
2 N 2 B
200
190
151
236
187
210/15
1 N 2 B
2 N 2 B
200
136
120
135
119
3 N 2 B
100
2 N 2 B
68/77
69/77
14 210/18
m = mesh size mm
y = yarn size
t = tapering ratio
n = number of meshes
400
77/89
77/89
12 210/27
2 - panel front part
4 - panel back part
600
89
89

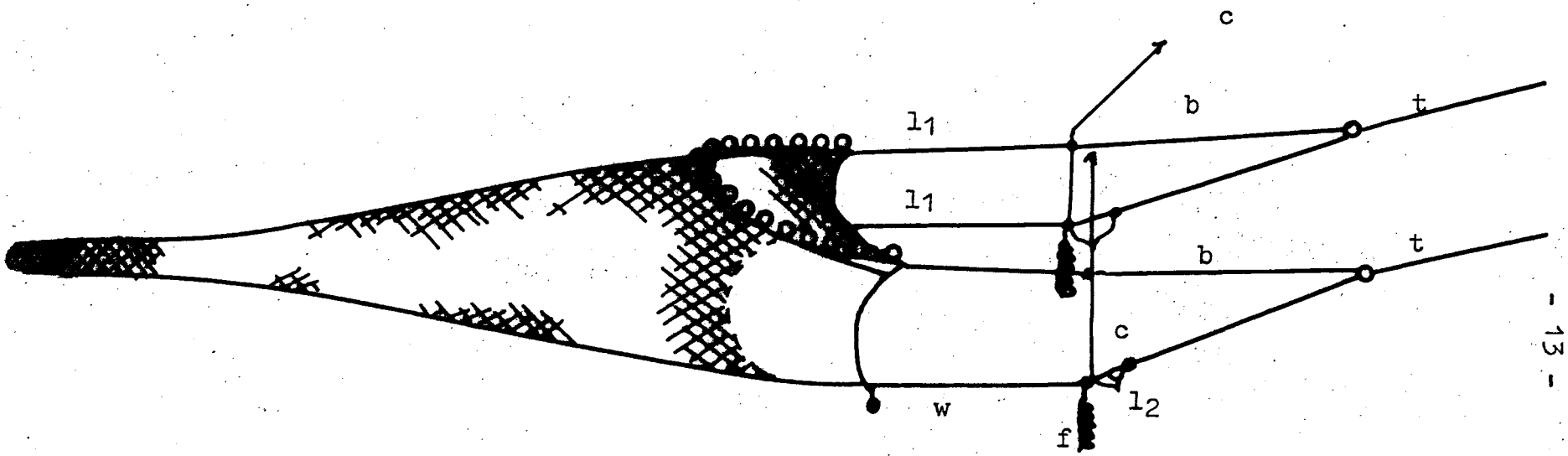


Fig. 2 b: Experimental two-boat eel-trawl for bottom and pelagic trawling

l = legs l_1 = 30 m; l_2 = 1.3 m
c = connecting bridle = 4.5 m
b = bridle =75 m
t = towing warp
f = front weight =200 kg
w = weight at wing tips = 25 kg

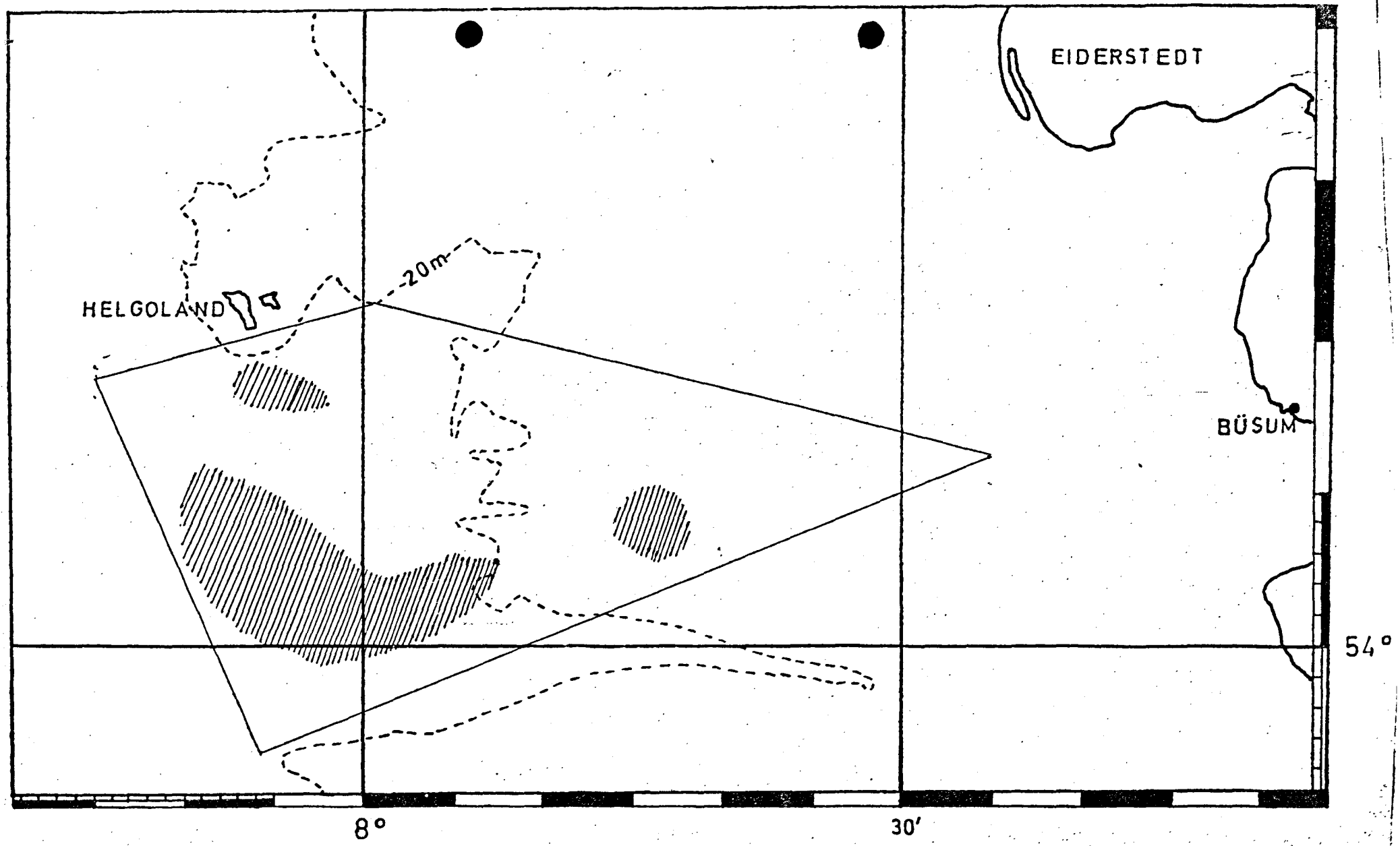


Fig. 3: Area of eel-trawling in the German Bight

Main area of commercial eel-trawling

areas of more than 13 (up to 43) kg eels per hour of trawling

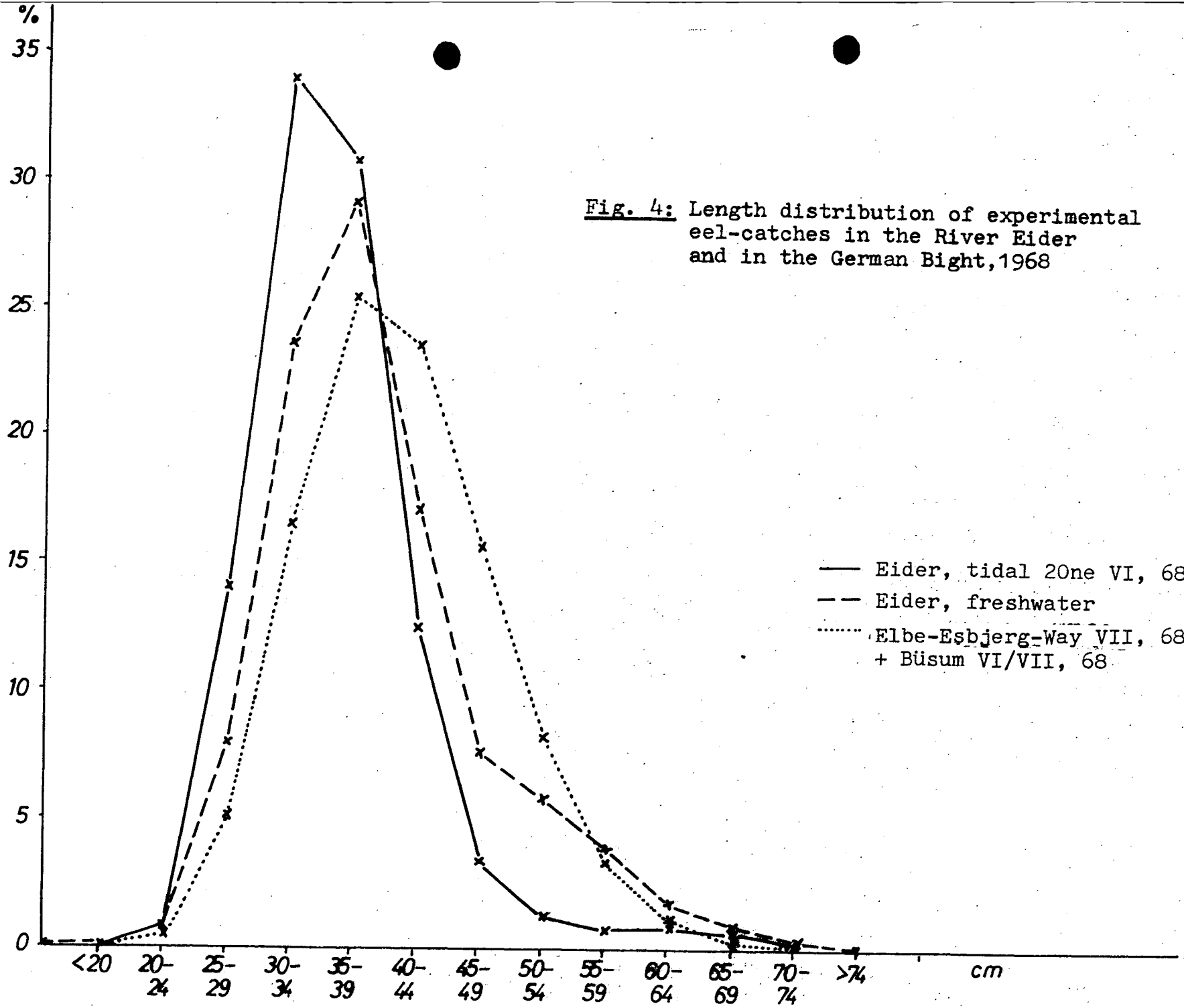


Fig. 4: Length distribution of experimental eel-catches in the River Eider and in the German Bight, 1968