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On the effects of tickler chains

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INTRODUCTION.

A first experiment was carried out aboard the R.V. "Hinders", comparing a beam trawl with lightly ballasted groundrope with a similar net equipped with tickler chains.

When fishing on rough grounds Belgian fishermen tend to use anti-stone chains. This device consists of a series of longitudinal chains from the beam to the groundrope and connected to several transverse chains. It is meant to prevent rocks and stones entering into the net.

It is a general feeling that the digging effect of this type of chains into the sea-bottom is rather limited. This effect however was not investigated, but as a first approach the damage to caught fish and invertebrates was examined. For the time being a comparative experiment between an anti-stone chains trawl and a similar gear equipped with tickler chains has been undertaken aboard a commercial vessel in order to determine the catch ratio and the damage.

## 2. MATERIAL AND METHODS.

### 2.1. First experiment.

Two series of trawling were carried out aboard the R.V. "Hinders" (21 m in length, 78 gross tonnage, 230 horse power), with in total 24 hauls of an average duration of  $\frac{1}{2}$  h.

The first series took place in June 1971 during the spawning period of soles and the second one in September 1971 (non-spawning period).

Fishing was carried out off the Belgian coast at an average depth of 12 m (figure 1). The towing speed was 3 knots.

Beam trawls were used with shrimp gear (P.A.) without chains to port and shrimp gear (P.A.) with succesively 2, 3 or 4 chains (diameter 0.7 mm) to starboard.

The length of the beams was 6 m. The meshsize was 9 mm. The ground-rope was 7.7 m in length.

The catch mainly consisted of soles (Solea solea L.) (95.0 %). The quantity of other commercial species was too small to allow any conclusion.

The whole catch of soles was examined and classified in age-groups of 0, I, II and III and more years. The final results were expressed in number of individuals per hour fishing and the catch ratio  $\left( \frac{\text{number/h.f. gear with chains}}{\text{number/h.f. gear without chains}} \right)$  was determined.

The observations cover only day fishing.

### 2.2. Second experiment.

The second experiment took place aboard a commercial beamtrawler (21 m in length, 98 gross tonnage, 425 horse power) off the Belgian

coast at a depth of 15 m (figure 2). The towing speed was 4 knots. The average duration of the haul was 1 hour.

To the portbeam a trawl of 4 m (P.A.) without chains and covered on top in the cod-end with small meshed netting (40 mm) was attached.

To starboard the same type of trawl had alternatively 3 (weight 126 kg) or 6 (weight 234 kg) tickler chains (diameter 18 mm).

The length of the groundrope of both trawls was 5 m. The meshsize was 75 mm.

In total 16 hauls were carried out and the catch of soles (Solea solea L.) and plaice (Pleuronectes platessa L.) as well as invertebrates and debris was recorded.

The catches mainly consisted of soles (15 %) and plaice (50 %).

The catches were expressed in number of individuals per hour fishing and the catch ratio was determined. The catches of soles and plaice were classified in age-groups of I, II and III- and more years.

The observations cover day and night fishing in the first week of August 1972.

### 3. RESULTS.

#### 3.1. First experiment.

As the composition in age-groups was substantially different during the spawning and non-spawning period, the calculations were made separately for either period. As a matter of fact, the amount of 0-soles, born in

May-June 1971, constitutes more than 99 % in terms of number of the September catches. On the other hand, soles of II, III- and older groups are more frequent (nearly 50 %) in the June catches.

### 3.1.1. Spawning period.

The results of 13 hauls made during the spawning period are given in table 1.

Table 1 - Catch ratio for soles when using 3 or 4 chains.

Age-groups	0	I	II	III and older
Using 3 chains	0.77	0.90	1.63	1.83
Using 4 chains	1.18	1.13	1.74	1.85

From the results of table 1 the conclusions can be described as follows :

- a) The effect resulting from the use of chains on the undersized 0- and I-groups is rather insignificant.
- b) A high catch ratio varying between 1.63 and 1.74 of the undersized II-group (19-24 cm) with 3 and 4 chains is obtained.
- c) The sized soles have a high catch ratio (about 1.8) with chains.

### 3.1.2. Non-spawning period.

The soles, born in May-June 1971 on the spawning grounds, were abundant in the September catches. The results of 11 hauls made during the non-spawning period are shown in table 2.

Table 2 - Catch ratio for soles when using 2 or 4 chains..

Age-groups	0	I	II	III and older
Using 2 chains	1.79	0.80	0.60	1.63
Using 4 chains	1.98	1.83	0.43	1.23

The figures for soles of classes I, II, III- and older were too small to obtain reliable results. The catch ratio for the 0-group is undoubtedly high : 1.79 when using two chains and 1.98 when using 4 chains.

### 3.2. Second experiment.

In the second experiment the catches of soles and plaice were examined as well as invertebrates and debris.

#### 3.2.1. Damage to soles and plaice.

Scale damage to soles as well as the presence of less lively soles was only noticed in the catches with additional chains. The extent of this damage was limited to the older classes and was related to the amount of bycatch and debris in the cod-end (table 3).

As for plaice scale damage and less liveliness was restricted to the catches with additional chains. The extent of damage was not clearly correlated with age-groups. In this case the relation between damage and size of bycatch and amount of debris in the cod-end was also less clear (table 3).

Table 3 - Scale damage and condition (in % of total catch).

Soles	Reference catch (all groups)	Using 3 chains			Using 6 chains		
		I	II	III and older	I	II	III and older
Scale damage 1	-	-	-	-	-	-	1
Scale damage 2	-	-	-	-	-	-	3
Stunned	-	-	-	10	-	20	80
Less lively	-	-	-	40	-	5	15
Bycatch and debris (number h/f)	117.8	309.5			606.6		
Plaice	Reference catch (all groups)	Using 3 chains			Using 6 chains		
		I	II	III and older	I	II	III and older
Scale damage 1	-	0.5	1	1	0.5	1	1
Scale damage 2	-	1	1	2	1	2	1
Stunned	-	5	15	5	10	5	5
Less lively	-	2	10	3	5	2	10
Bycatch and debris (number h/f)	117.8	309.5			606.6		

Scale damage 1 : < 50 % ; scale damage 2 : > 50 %.

"Rotten" and dead undersized plaice were frequently found in the catches. The reason of this phenomenon most probably lies in discarding of undersized plaice by the fishermen.

### 3.2.2. Damage to invertebrates.

The number of starfishes (Asterias rubens L.) in every haul were counted. The non-damaged individuals were separated from the ones recently damaged (very severe cuts or wounds). The results are listed in table 4.

Table 4 - Catch ratio for starfishes when using 3 or 6 chains.

	Non-damaged	Damaged
Using 3 chains	2.63	2.88
Using 6 chains	1.08	1.10

The experiments show a higher catch ratio of 2.6 for starfishes while using 3 chains, whereas the effect of 6 chains seems to be rather undifferent. The percentage of destruction when using 3 chains was 11.9 and when using 6 chains 8.2. These proportions are nearly similar to the ones recorded while fishing with chainless gear (viz. 10.9 % and 8.0 %)(table 5).

Table 5 - Destruction ratio for starfishes.

	Total number of starfishes(h/f)	Number of damaged starfishes(h/f)	Ratio
No tickler chains	117.8	12.8	10.9
Using 3 chains	309.5	36.8	11.9
No tickler chains	564.8	45.2	8.0
Using 6 chains	606.6	49.6	8.2

The high catch ratio for Aphrodite aculeata L., Sepia officinalis L., Buccinum undatum L., Eupagurus bernhardus L., Portunus holsatus L., Mytilus edulis L. was more evident when 3 chains were used instead of 6 chains.

### 3.2.3. Debris.

The experiments were carried out on muddy grounds and on rocky grounds. When using tickler chains the amount of mud and pebbles was higher than in the reference catch.

### 3.2.4. Catch ratio for soles and plaice.

The catch ratio for soles, is given in table 6.

Table 6 - Catch ratio for soles when using 3 or 6 chains.

Age-groups	I	II	III and older
Using 3 chains	0.50	1.00	1.00
Using 6 chains	1.00	0.70	1.16

For the age-groups I and II the quantity in the catch was too low to allow any conclusion.

When using 3 chains the catch for soles of the group III-years and older did not differ from the one without chains. Using 6 chains gives a catch ratio of 1.16.

The catch ratio for plaice is expressed in table 7.

Table 7 - Catch ratio for plaice when using 3 or 6 chains.

Age-groups	I	II	III and older
Using 3 chains	1.10	1.13	1.10
Using 6 chains	1.05	0.91	0.84

For the three age-groups the catch ratio is the same when using 3 chains. This rate is higher than when using 6 chains. When doing so the catch ratio seems to decrease with increasing age of the fish.



#### 4. CONCLUSIONS.

1. During the first experiment the use of 2 or 4 tickler chains leads to a higher catch ratio of about 1.5 to 2 for the undersized as well as for the sized soles.

2. During the second experiment with anti-stone chain gear :

a) Damage to soles and plaice was only found when using additional tickler chains.

b) The catch ratio for starfishes was the highest (2.6) when using 3 tickler chains. The other invertebrates were also more abundant in the catches with 3 chains.

c) The amount of mud and pebbles was always higher when using tickler chains than in the reference catches.

d) As to soles and plaice no evident difference between catches made with and without additional tickler chains was found.

3. The experiments were carried out on a limited scale (number of ships, area, period, type of gear).

There seems to be an inconsistency in the second experiment when increasing the number of tickler chains. For several groups a lower catch ratio was obtained.

The question may arise whether the cause of these unexpected results may be due to gear and vessel characteristics not being in complete harmony.

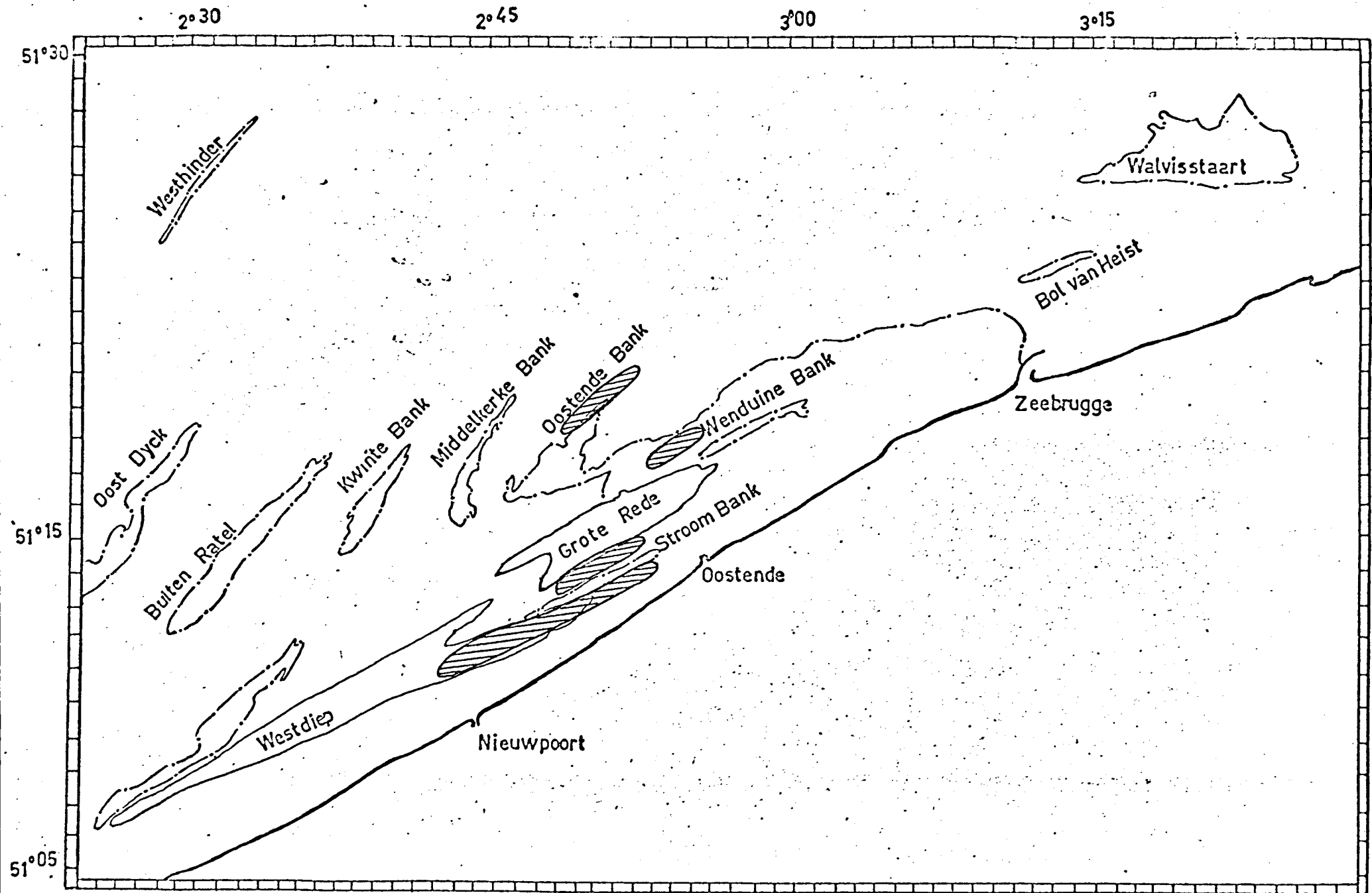


Figure 1 - Trawl haul positions (first experiment)

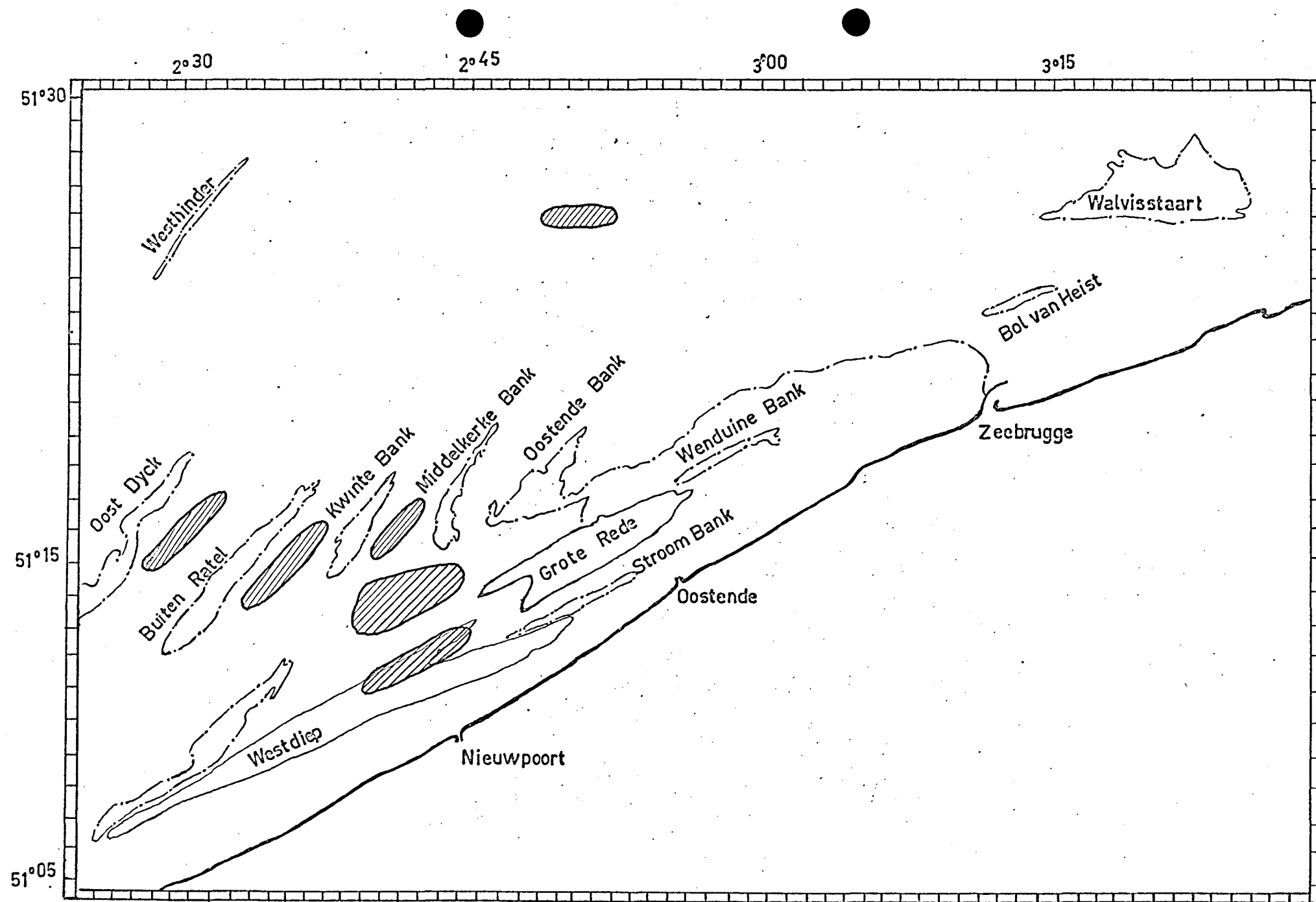


Figure 2 - Trawl haul positions (second experiment)