RIJKSINSTITUUT VOOR VISSERIJONDERZOEK
Netherlands Institute for Fishery Investigations

Haringkade 1 - P.O. box 68 - 1970 AB IJmuiden - the Netherlands
phone.: +31 2550 64646 - telex 71044 rivo nl

Department: **Coastal and Inland Fisheries**

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Interim report.

Migration of sea-trout (Salmo trutta trutta L.) from the coastal area near Haringvliet and Nieuwe Waterweg, The Netherlands.

Authors: Cazemier, W.G., F.T. Vriese, J.A.M. Wiegerinck

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Project leader W.G. Cazemier
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SUMMARY

During the months of June and July 1990 a number of 1071 sea-trout (Salmo trutta trutta L.) have been captured, of which 964 were tagged with Carlin tags, at the seaside of the Haringvliet sluices near the Dutch coast.

Length-frequency distribution has been determined and scale samples were taken. Information about catches of (sea)-trout in the rivers Lek, Waal and Meuse has been collected. Up till the end of August 21 recaptured trout were reported of which 18 have been caught in the Haringvliet-area where they were released, two were caught near the coast in northern direction and one in the river Waal.

Preliminary conclusions are:

- Sea-trout gathers in the Haringvliet estuary in June, July and August, at the outlet of the Haringvliet sluices, where freshwater from the rivers Rhine and Meuse is discharged to the North Sea at low tide.
- A large group of mainly immature sea-trout lives in the coastal area.
- Mature, ripening (sea)-trout migrates upward in the rivers Lek, Waal and Meuse.
- Migration routes from the coast to the rivers followed by the latter cohort, has not yet been revealed.

PREFACE

This interim report deals with an experiment on sea-trout in the framework of the Rhine Action Program. The research is carried out in 1990 by the Department of Coastal and Inland Fisheries of the Netherlands Institute for Fishery Investigations (RIVO).

Technical and physical support has been provided by the Technical Department of RIVO. A research vessel of the Ministry of Agriculture, Nature Management and Fisheries and two professional trawlers carried out the fishing.

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The investigations will continue in 1990 and 1991. In January 1992, a final report will appear.

1. INTRODUCTION.

Within the scope of the Rhine Action Program (R.A.P.), research is going on to enhance quantity and quality of the fish populations in the river Rhine. The anadromous salmonids are an important group in this respect.

The restoration of the extinct Atlantic salmon (Salmo salar L) population in the Rhine is one of the main goals of the R.A.P..This is considered to be a bio-indicator for the environmental quality of the Rhine, especially for the water quality. The latter is of great importance for The Netherlands, because it determines to a large extend the quality of the Dutch surface waters in general.

Several problems are to overcome before the reinstatement of a salmon population can succeed. There are, however, some indications that small populations of (sea)-trout (Salmo trutta trutta L.), a close relative of the salmon, exist in the rivers Rhine and Meuse. The aim of the present research is to establish this with certainty. Therefore the result of this work will be of major importance for the draw up of a plan to facilitate the reinstatement of a salmon population.

The biological status, as well as the migration in general of the (sea)-trout in the rivers Rhine and Meuse and at the Dutch coast, are the first items to investigate. Therefore a mark-recapture experiment near the Haringvliet sluices has been carried out to assess the migration routes of trout. It is important to reveal whether they enter Dutch fresh water bodies and if so where. Moreover, it is very worthwile to establish the routes they can or cannot take through the Dutch river-branches to reach the higher stretches of the rivers Rhine and Meuse.

Up till now the access from the North Sea to the rivers is considered to be difficult. Sluices in the IJsselmeer and Haringvliet-dam, together with the weirs in the rivers Lek and Meuse, are considered to be serious bottle-necks for the enhancement of the populations of anadromous fish species.

2. Aims of the project.

- To gather general information about the sea-trout, present during the summer in the coastal zône off the Haringvliet sluices and the Nieuwe Waterweg, in the southwestern part of The Netherlands.

- To find out whether these anadromous salmonids pass the Haringvliet sluices and/or migrate through the Nieuwe Waterweg to the higher parts of the rivers Rhine and Meuse.

3. Methods.

In the months June and July 1990 three fishing vessels equipped with a pelagic trawlnet fished for sea-trout at the seaside of the Haringvliet sluices and in the nearby mouth of the Nieuwe Waterweg (see map 1). The sea-trout were tagged under general anaesthesia (300 ppm ethylene glycol monophenyl ether in water) with an individual tag (Carlin type). The tags were attached with double stainless steel wire.

Total lengths have been determined and scale samples were taken from an area on the left-hand side of the fish, 3-6 rows above the lateral line and on a line extending from the anterior edge of the anal fin to the posterior edge of the dorsal fin. All tagged trouts have been immediately released after tagging in the same area as they were caught (see map 1).

Much publicity has been given to this tagging program to stimulate the report of captured tagged trout. Those who report will receive a reward and the information about the fish on the date when it was tagged. Professional fishermen, fishing with special fyke-nets (salmon stakes), have recorded their sea-trout catches in the rivers Lek, Waal and Meuse (see map 1).

4. Results.

4.1. Captures and tagging.

A total number of 1071 sea-trout has been captured in the tidal part of the Haringvliet estuary; the majority in the vicinity of the seventeen big sluices through which water from the rivers Rhine and Meuse drains into the sea, at low tide. Daily catches were highest during the period 19th - 24th of July, when about a hundred specimens were caught at average. Besides sea-trout, large amounts of sprat and juvenile herring were caught, together with a variety of other marine species and freshwater fish.

A number of 964 trout has been tagged and released outside the Haringvliet sluices. A total of 107 trout was discarded due to poor condition after landing.
Hauls at the riverside of the Haringvliet sluices yielded only freshwater fish. Despite a number of attempts no sea-trout could be caught inside the mouth of the Nieuwe Waterweg nor in the coastal area nearby.

The length-frequency distribution of the total catch is shown in figure 1; figure 3 shows the length-frequency distribution of the trout over 40 cm.

4.2. Recaptures.

Since the tagging experiment was terminated at the end of July, a number of 21 tagged sea-trout has been reported to the institute. The recaptures are plotted on map 1 as black circular spots. Ten have been landed by anglers in the same area they were released after tagging and one about nine kilometers outside the rivermouth.

Another eight have been captured with professional gear of which seven in the area the trout was released and one near the coast about thirty kilometers north from the Haringvliet estuary. Besides the recaptures in the marine environment one tagged trout, 70 cm total length, has been reported from the river Waal, 80 km from the coast, 25 days after it was tagged.

4.3. Catches in the rivers.

A small number of professional fishermen, fishing with stake-nets, recorded their trout catches in the rivers Lek, Waal and Meuse. This fishery was executed from about the middle of June to the middle of August 1990.

The fishery in the river Lek has been carried out specially for the migration experiment, because no such fishery was present in the lower part of this river. A total of 74 trout were caught. The length-frequency distribution is presented in figures 2 and 4.

According to the information of the fishermen, the total number of trout, caught in the river Waal, amounts to almost 500, while a number of 70 has been reported from the river Meuse. Length distribution of the catches in Waal and Meuse are very much similar to that of the river Lek.

5. Discussion.

5.1. Distribution of trout.

The discharge of freshwater into the sea is supposed to attract anadromous trout. The summer of 1990 has been relatively dry and as a consequence the discharges were low through the Nieuwe Waterweg and especially through the Haringvliet sluices. Taken this in consideration the total catch of over 1.000 sea-trout in the Haringvliet estuary can without any doubt been qualified as a success.

The failure to catch trout at the riverside of the sluices has most probably to do with the presumed small chance for trout to pass the drains in upward direction. Moreover, if they should succeed, they will spread out in the wide river (2.7 km) and possibly migrate upward immediately to higher stretches.

Within the Nieuwe Waterweg sea-trout will also dispense and migrate very easily to the higher reaches. This may be the reason why trout were not captured there by trawlfishing.

Catches with the passive salmon stake nets in the higher stretches of the rivers Lek, Waal and Meuse were made on places situated from 80 up to 125 km from the coast. This demonstrates that the trout succeeds in migrating in upward direction. Whether these trouts indeed come from sea is not certain.

5.2. Composition of the catches.

The length-frequency distribution of the trout caught by means of trawl nets in the estuary and with fyke nets in the rivers are supposed to give a rather reliable picture of the real composition of the cohorts present.

In the estuarine part of the Haringvliet the majority of the fish has a total length from 16 up to 40 cm (see figure 1). These fishes are sexually immature. Trout with a length of over 40 cm have ripening gonads and will most probably be ready for spawning within 5 to 6 months. The number of these larger trout is much lower than the number of those in the smaller length-catagories. Most likely there will be different reasons for this phenomenon, like mortality over a different period of time, differences in year classes, migration to the river.

The last cause is concluded from the fact that the length-composition of the riverine catches (figure 2) shows similarity to that of the cohort of over 40 cm staying in the coastal zône. Sea-trout of more than 73 cm were not captured near the Haringvliet sluices but did occur in the rivers.

5.3. Recaptures.

During and after the period of tagging in the months of July and August a total of 21 recaptures have been reported. The locations of recaptures show that the qreater part of the tagged trout stayed in the area they were released. On the other hand most of the angling is concentrated in this area. At least a few have migrated along the coast.

One very important record came from the river Waal. This recapture proved for the first time that sea-trout living outside the Haringvliet sluices is able to migrate into a Rhine branch. It is not sure, however, whether it passed the Haringvliet sluices or migrated upstream through the nearby Nieuwe Waterweg.

Weirs erected in the rivers Lek and Meuse in the past, have no or only poor fish pass facilities. Trout migrating through the river Waal, however, can reach higher parts of the river Rhine. There is not a single physical obstruction till the weir of Iffezheim, near Baden Baden in Germany.
Recaptures of tagged sea-trout in the German (c.q. French or Swiss) part of the Rhine watershed would demonstrate where in the Rhine or Meuse, or their tributaries, these sea-trout are going (to spawn ?).
An important result of our extensive tagging program in Ketelmeer (near the IJssel river mouth) in April 1989, was the recapture of a trout in July 1990 in the river Rhine near the Gambsheim weir, about 30 km south of Iffezheim.

6. Preliminary conclusions.

1. Sea-trout gathers in the Haringvliet estuary in June, July and August at the outlet of the Haringvliet sluices, where freshwater from the rivers Rhine and Meuse is discharged to the North Sea at each low tide.

2. The number of trout staying near the outlet of the sluices seems to fluctuate.

3. A total of 1071 trout have been caught with pelagic trawls, of which 964 were tagged and released. At least a few thousand trout must have visited this area in this period.

4. Recaptures indicate that the majority of trout stayed in the Haringvliet estuary at least till the end of August.

5. Most probably a small group migrated along the coast to the North (based on two recaptures).

6. Sea-trout is able to migrate from the Haringvliet estuary to the rivers (based on one recapture on the river Waal).

7. Up till now it is unknown whether sea-trout are capable to pass the Haringvliet sluices. Most probably migration along the Nieuwe Waterweg is far more important.

8. The majority of the cohort at the Haringvliet sluices area belongs to the length classes of 16 up to 40 cm, mainly sexual immature, while a relatively small group runs from 40 up to over 70 cm (mature).

9. The length-frequency distribution of sea-trout landed by river fisheries 80 to 125 km inshore, corresponds to the group of larger trout, 40 to over 70 cm, caught at the Haringvliet sluices. So the immature sea-trout, 16 to 40 cm, do not enter the rivers that far.

10. During the months of June and July sea-trout density was apparently very low in the following waterbodies:

    - the Haringvliet area at the riverside of the sluices.
    - the Nieuwe Waterweg and adjacent canals and harbours.
    - along the coast between Haringvliet and Nieuwe Waterweg.

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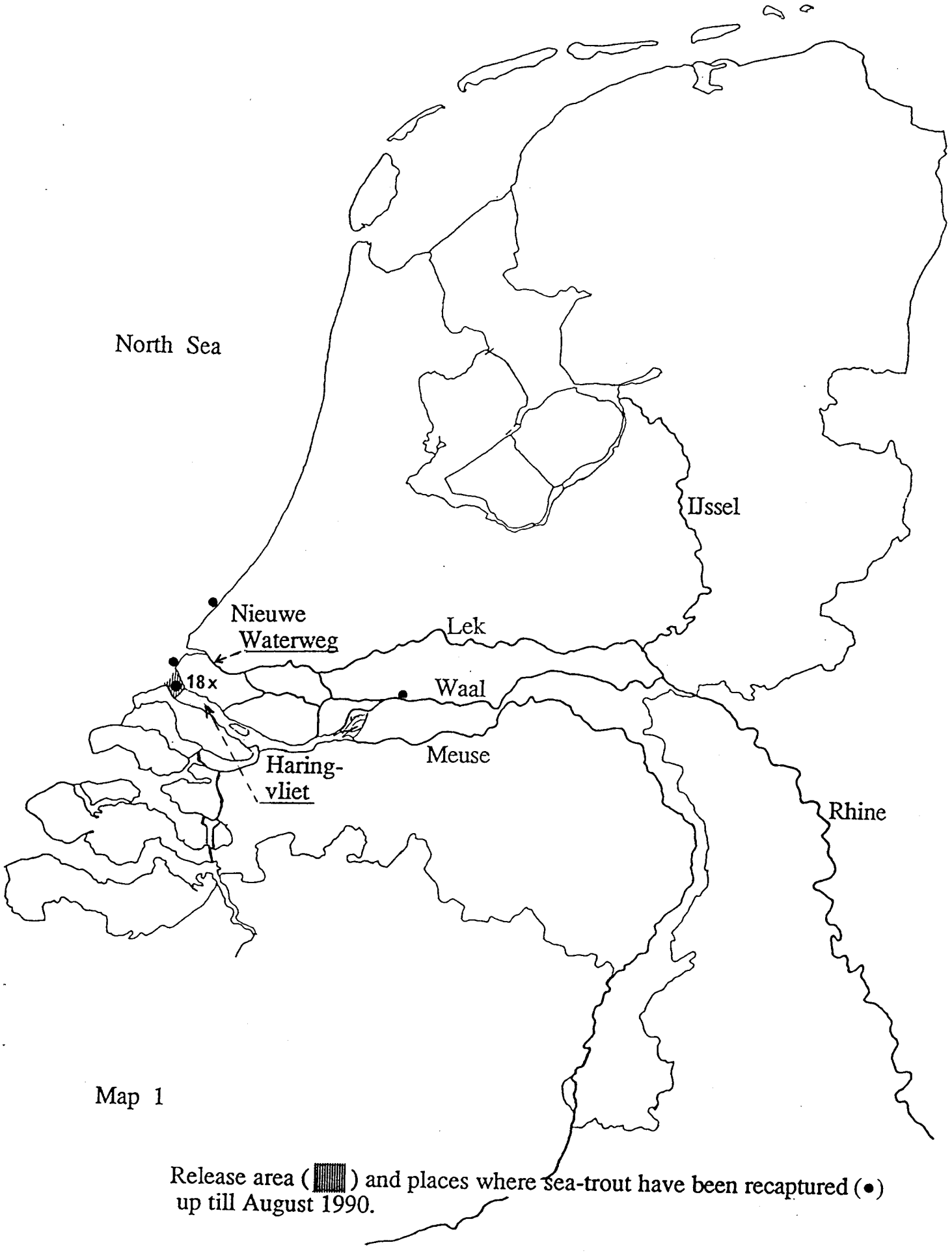

Map 1

Release area (▒▒) and places where sea-trout have been recaptured (•) up till August 1990.

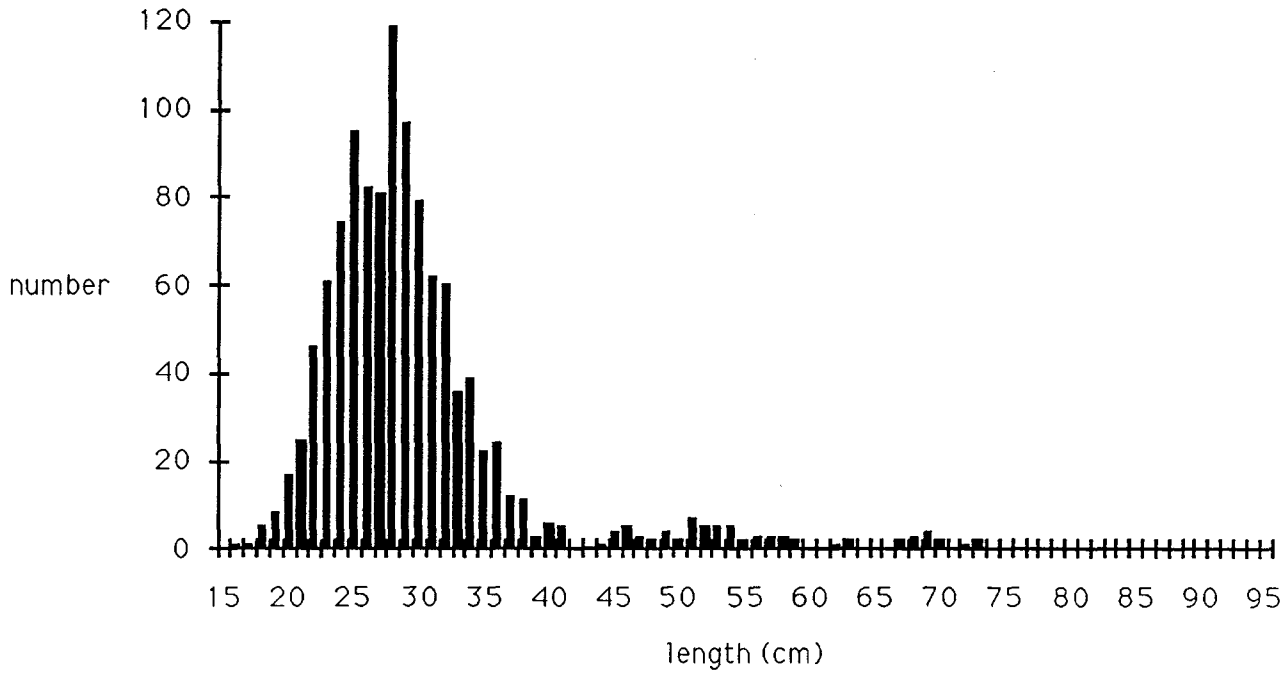

Fig. 1: Length-frequency distribution (LFD) of sea-trout caught at the sea-side of the Haringvlietsluices.

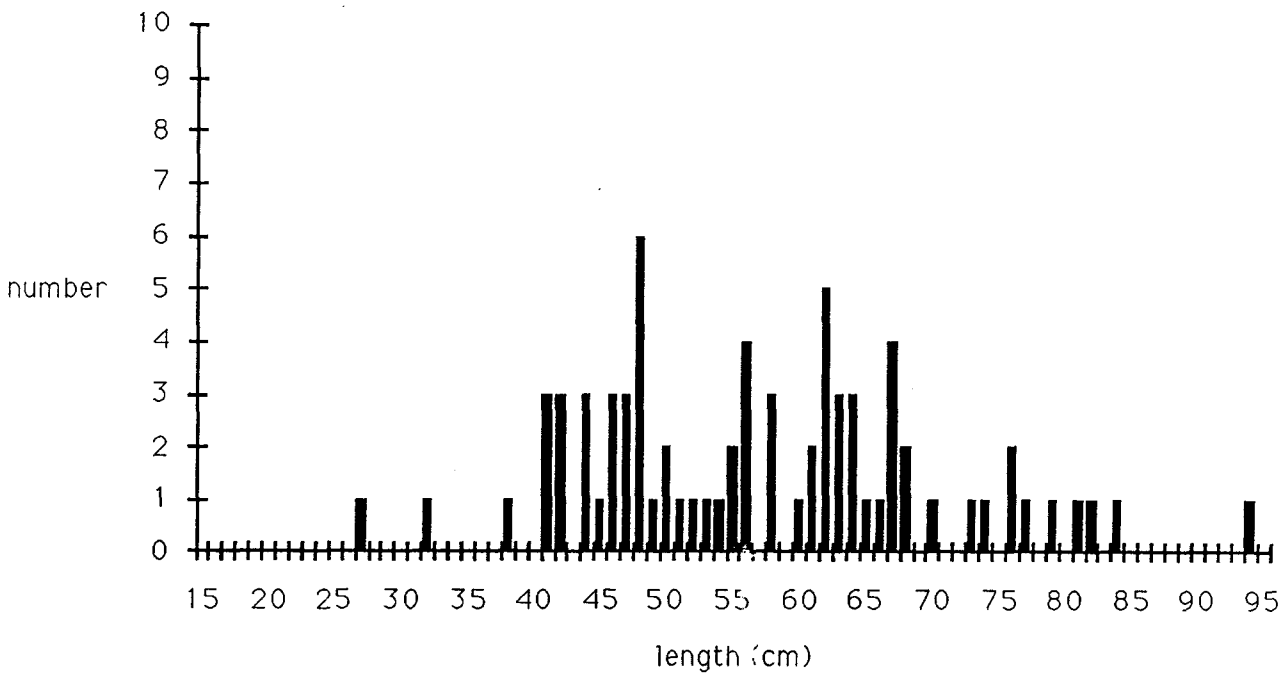

Fig. 2: LFD of sea-trout landings on the river Lek.

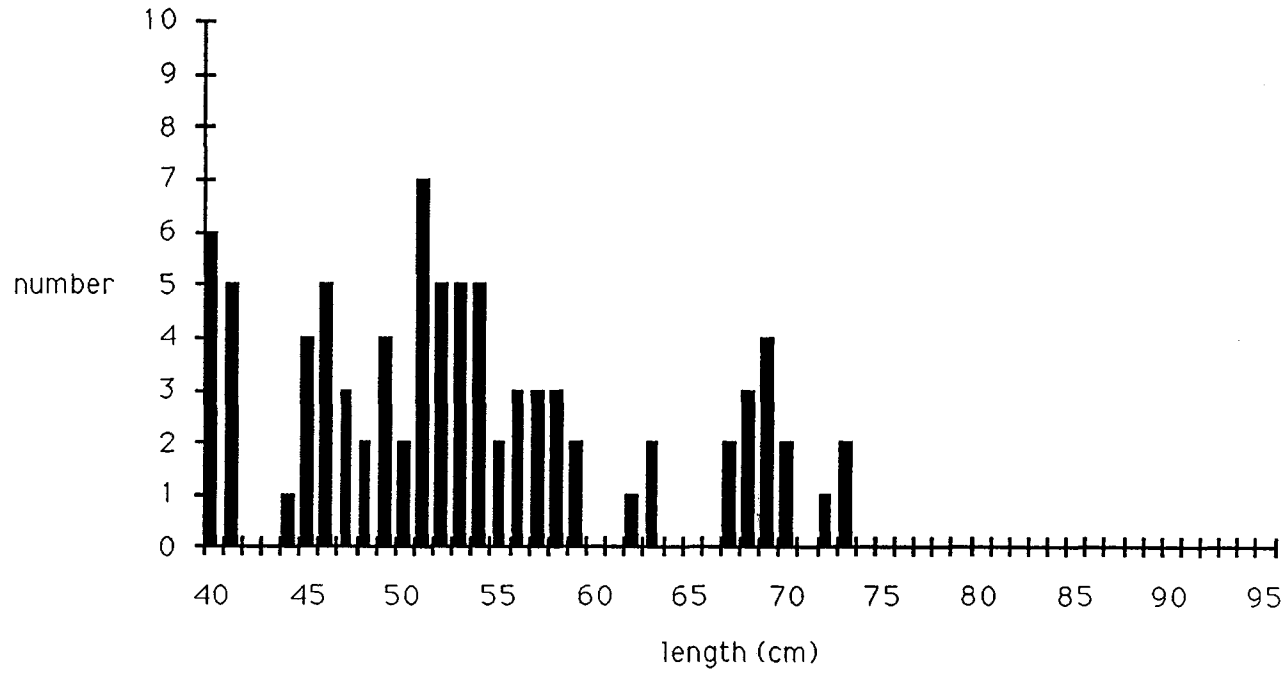

Fig. 3: LFD of sea-trout of 40 cm and larger, caught at the sea-side of the Haringvlietsluices.

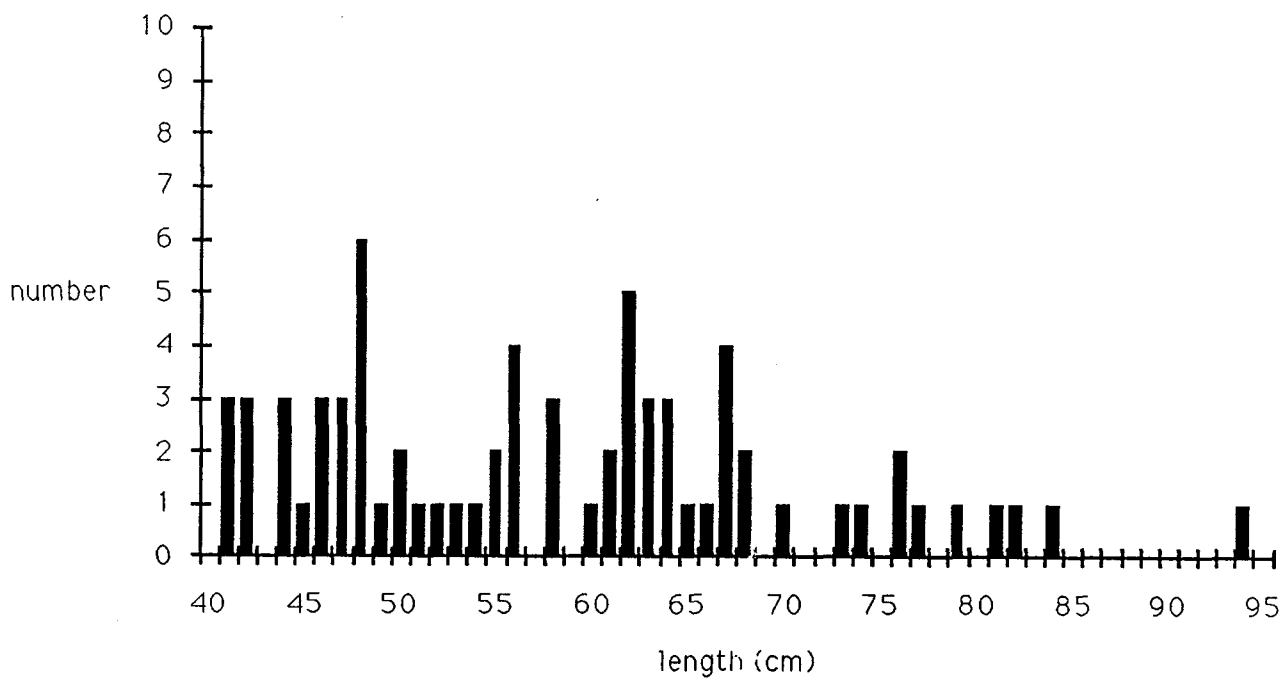

Fig. 4: LFD of sea-trout landings of 40 cm and larger, on the river Lek.