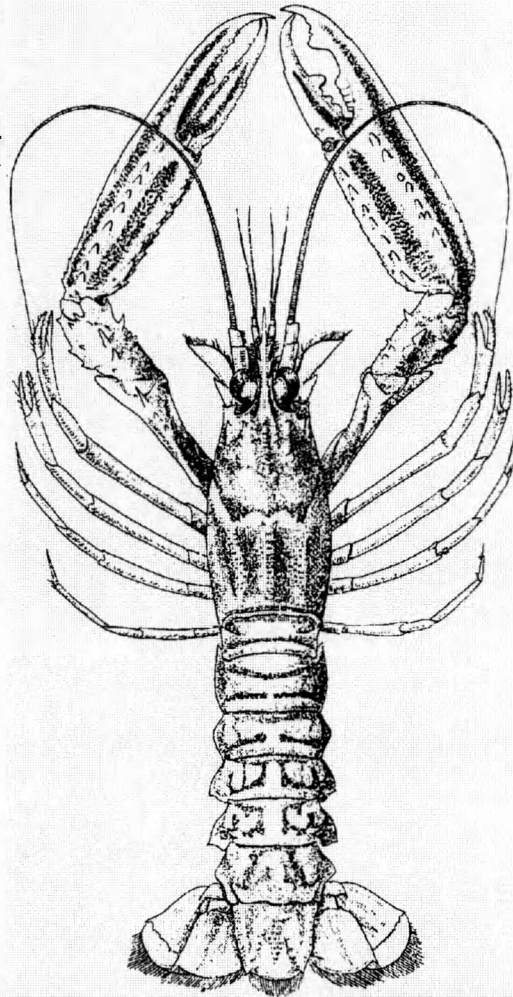


**Commission of the European
Communities**

**Directorate General for
Fisheries**

Final Report



**Selectivity and discards
in the *Nephrops* fishery
- Belgium -**

By H. Polet and F. Redant

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Final Report

Selectivity and discards in the *Nephrops* fishery - Belgium

by

H. Polet and F. Redant

Fisheries Research Station
Ankerstraat 1
8400 Oostende
Belgium

Director : Dr. P. Hovart

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ABSTRACT

Within the general framework of a collaborative research programme between the Fisheries Research Station (Ostend, Belgium) and DIFTA (Hirtshals, Denmark), three sampling campaigns were carried out on board of a Belgian *Nephrops* trawler, to investigate codend selectivity and discarding of *Nephrops* and finfish (whiting, cod, gurnards, dab, plaice and sole) in the Botney Gut - Silver Pit area (central North Sea).

The codend selectivity curves for *Nephrops* varied widely, with most of the variability being attributable to the weather conditions. In general, selection improved with increasing state of sea, which is indicative for wave height. The selection factor, corresponding to the prevailing sea state in the area was 0.51, with an L_{50} of 34.4 mm CL, and a selection range of 15.5 mm.

Rather surprisingly, the 90 mm codend was found less selective than the 70 mm codend; a phenomenon that could be related to the differences in netting material (viz. double braided polyethylene for the 90 mm and single braided polyamide for the 70 mm codend).

The L_{25} 's for *Nephrops* and whiting were only slightly above the Minimum Landing Size, which indicates that the selective properties of the codend are in agreement with the general principle that the L_{25} should be at, or at least close to, the Minimum Landing Size.

The numbers of undersized cod, plaice and sole discarded by the *Nephrops* trawlers were generally small, with values hardly exceeding 30 individuals per species, per day. Conversely, the numbers of whiting and dab discarded were sometimes extremely high.

Fishermen's selection curves for *Nephrops* were much sharper for the males than for the females. The differences in selection pattern were related to either the occurrence of soft females in the catches, or the gonadal development of the females. Discarding of both males and females was clearly influenced by the quantities of *Nephrops* taken.

The fishermen's selection curves for cod, dab, plaice and sole were very steep, with an L_{50} close to (cod, plaice and sole) or clearly above (dab) the Minimum Landing Size. The curves for whiting were mostly asymmetrical, with an L_{50} far above the Minimum Landing Size. Fishermen's selection of particularly whiting and dab seemed to be driven primarily by the local market conditions and not by the Minimum Landing Size.

Discard survival experiments on undersized *Nephrops* revealed a clear relationship between the type of damage sustained during the catching and sorting process, and the immediate mortality rates. The overall, short-term survival rate of the discards was tentatively estimated at 40%.

EXECUTIVE SUMMARY

Introduction

In June and September 1993, three sampling campaigns were carried out on board of a Belgian *Nephrops* trawler, currently operating in the Botney Gut - Silver Pit area (central North Sea), to investigate codend selectivity and discarding of both *Nephrops* and finfish under commercial conditions.

The selectivity experiments were done by means of the covered codend technique, and were focused on *Nephrops* and whiting, which is generally considered as being one of the most important by-catch species in the *Nephrops* fishery. Apart from these two species, the discard studies also included several other commercial finfish species, regularly occurring in the catches and/or landings of the *Nephrops* trawlers, such as cod, gurnards, dab, plaice and sole.

Selectivity studies

During the June campaigns, three different trawl configurations were investigated on their selective properties, viz. a standard *Nephrops* trawl with a 70 mm codend, a standard trawl with a 90 mm codend, and a trawl with a square mesh window in the top panel and a 70 mm codend.

In total 45 hauls were made for the selectivity studies. The measurements included about 35,450 *Nephrops* (carapace length CL to the nearest mm) and about 15,600 whittings (total length to the nearest cm below).

The selectivity parameters were calculated by fitting a logistic curve to the observed retention rates, by means of a maximum likelihood technique. For *Nephrops* the database was sufficiently large to allow the calculation of selection curves for each haul separately. For whiting, however, the retention rates for individual hauls were too dispersed to produce reliable selection curves, and therefore only the pooled data were used. Since the mesh size of the cover was too large to avoid the escapement of the smallest *Nephrops* and whiting, the data had to be adjusted to compensate for this loss.

In technical terms, the codend cover with floats performed well. No data sets needed to be rejected for reasons of inconsistency. However, some masking of the codend meshes by the cover could have taken place and hence the selection factors might be slightly underestimated.

For *Nephrops* the haul by haul variability of the selection factor was quite large. No correlation could be found between the selection factor or range, and the volume of the catches.

The data, however, indicate that part of the variability was attributable to the weather conditions. An analysis of the data in relation to the weather conditions, as reflected by the state of the sea, revealed a positive relationship between selection and sea state: with calm weather, selection was very poor (SF = 0.36, sea state calm) but as soon as the waves became higher, selection started to improve (SF = 0.56, sea state rough). The movements of the trawl, particularly when the trawl is hauled, could be an important factor in the escapement of *Nephrops*, which usually do not actively try to evade from the trawl.

Therefore it seemed reasonable to tune the selectivity parameters for the standard 70 mm codend according to the prevailing sea state in the Botney Gut - Silver Pit area. This gave an L_{50} of 34.4 mm carapace length (CL), a selection factor of 0.51 and a selection range of 15.5 mm. The corresponding L_{25} was 26.7 mm, which is only slightly above the Minimum Landing Size. This indicates that the selective properties of the standard codend are in line with the general principle that the L_{25} should be at, or at least close to, the Minimum Landing Size.

The L_{50} for the 90 mm codend was 27.6 mm CL, which is markedly lower than for the 70 mm codend. This is exactly the opposite of what was expected. The double braided polyethylene used for the 90 mm codend, which is much more rigid than the single braided polyamide used for the 70 mm codend, was held responsible for this phenomenon. It is important to stress that fishermen would certainly choose for double braided polyethylene if the minimum mesh size would be increased. They still use polyamide for the 70 mm codends, because it is the only material readily available in this mesh size.

There is no strong evidence that *Nephrops* escapes through a square mesh window in the aft part of the top panel of the trawl.

For whiting, the selection factor and the selection range for the standard 70 mm codend were 4.13 and 6.8 cm respectively. The L_{25} was at 24.4 cm. This is slightly above the Minimum Landing Size, which again indicates that the selective properties of the standard codend are in agreement with the general principles on L_{25} and Minimum Landing Size.

The application of a 90 mm square mesh window resulted in an increase of the selection factor for whiting from 4.13 to 4.73. It should be kept in mind, however, that the extra escapes owing to the window, included mainly marketable fish.

As for *Nephrops*, selection did not improve with the use of the 90 mm codend (selection factor = 3.48). On the contrary: the smallest length classes of whiting (below the Minimum Landing Size) were retained in relatively larger numbers than in the 70 mm codend. Again, it must be stressed that the netting material for the 90 mm codend was double braided polyethylene,

for which it seems logical to have a worse selection than for a single braided polyamide codend.

Discard studies

During the June and September sampling campaigns, the catches from 42 hauls were examined on the length compositions of the landings and the discards of *Nephrops* and commercial finfish. For this aim about 30,700 *Nephrops* were measured, together with 7,200 whittings, 500 cod, 650 gurnards, 4,945 dabs, 2,165 plaice and 385 sole.

On 10 occasions, survival experiments were carried out with discarded *Nephrops*, to estimate the instantaneous mortality rate of the discards.

The numbers of *Nephrops* and by-catch fish caught, landed and discarded varied widely from one haul to another, depending on the season, the time of day and the location of the haul. Most striking was the difference between the two sampling campaigns in the numbers of *Nephrops* taken: from June to September the average number of *Nephrops* caught per day (i.e. during six hauls of 3½ hours each) increased by a factor of ≈10. Over the same period, the numbers landed increased by ≈6 and the numbers discarded by ≈23. Peak values in the numbers landed and discarded per day were recorded at the end of the September voyage, with figures of 40 10³ and 60 10³ individuals respectively.

In general, it appeared that the numbers of undersized cod, plaice and sole discarded by the *Nephrops* trawlers were very small, with values hardly exceeding 30 individuals per species per day. Conversely, the numbers of whiting and dab discarded were sometimes extremely high, depending on the season and on the area fished. For whiting, values exceeding 3.5 10³ discards per day were observed throughout the September voyage, and for dab values exceeding 8 10³ discards per day were noted during both voyages, particularly in the northwestern part of the Botney Gut.

Fishermen's selection curves for *Nephrops* and finfish were calculated using different models, such as the symmetrical Logit and Probit curves, and the asymmetrical Complex Log-Log and Log-Log curves.

In general the selection curves for male *Nephrops* were much sharper than for the females. In most cases fishermen's selection on the males could best be described by means of a relatively steep Logit or Probit curve, whereas a much smoother, and sometimes definitely asymmetrical Complex Log-Log curve usually gave the best fit for the females. The difference in selection pattern between males and females could be attributed either to the occurrence of large numbers of soft, recently moulted females in the catches, or to the developmental

stage of the female gonads, which is claimed to shorten their shelflife, especially when the females are fully mature.

In June, when the quantities of *Nephrops* taken were generally small, the L_{50} 's of the fishermen's selection curves for both males and females were around 28 mm CL (i.e. only 3 mm above the Minimum Landing Size of 25 mm). In September, however, when the catches were much larger, the L_{50} 's increased about 5 mm, to values between 32 and 34 mm CL.

The fishermen's selection curves for cod, dab, plaice and sole were very steep, with an L_{50} close to (cod, plaice and sole) or clearly above (dab) the Minimum Landing Size. The curves for gurnard were slightly smoother, with an L_{50} of about 27.5 cm (there is no Minimum Landing Size for gurnards in the North Sea). The selection curves for whiting, were mostly asymmetrical, with an L_{50} at least 5 cm, and sometimes even as much as 10 cm above the Minimum Landing Size. These results indicate that fishermen's selection of particularly whiting and dab is mostly driven by the local market situation, and not by the Minimum Landing Size.

The discard survival experiments on *Nephrops* revealed a clear relationship between the type of damage sustained during the catching and sorting process (1 or 2 claws missing, carapax and/or abdomen damaged), and the instantaneous mortality of the discards.

A pessimistic approximation of the short-term survival rate of the discards gave a value of about 40%, which is considerably higher than the rates reported by other authors for the Bay of Biscay and the Celtic Sea.

The results of particularly the discard studies and the survival experiments on *Nephrops* are of ultimate importance to the analytical stock assessments on *Nephrops* in the central and southern North Sea. The discard rates, derived from the fishermen's selection curves, will allow much more accurate estimations of the numbers discarded by the fleet. Combined with the discard survival rate, they will equally allow much more reliable estimations of the numbers removed at length, which are used to run the length and age based assessment models.

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1. Introduction

Until recently the mesh assessments and the analytical stock assessments of the Norway lobster, *Nephrops norvegicus*, in the central and southern North Sea, were hindered, amongst others, by the lack of data on codend selectivity, growth, natural mortality and discard survival. Both assessment working groups and advisory committees, including ACFM and STCF, have repeatedly stressed the need for such stock specific technical and biological parameters, which can be expected to improve the overall quality of the management advice, given for the *Nephrops* stocks in the North Sea area.

The present study aims to fill a number of these gaps in our knowledge on particularly the selective properties of *Nephrops* trawls, and on the discarding practices in the Belgian *Nephrops* fishery. In the margin of these investigations, attention was also paid to the composition of the finfish by-catch, and to the selectivity of the *Nephrops* trawls for whiting, which is known to massively occur on the *Nephrops* grounds.

2. Preliminaries to the experiments

2.1. Review of the literature

Symonds, D.J. and Simpson, A.C. (1971) : Preliminary report on a specially designed *Nephrops* trawl for releasing undersized roundfish.

ICES Council Meeting 1971, ICES-CM-1971/B:6.

Trials have been carried out with a separator trawl, with a 70 mm mesh top panel and top codend and a 50 mm lower panel and lower codend. Both codends were separated from each other by a 50 mm mesh netpanel and kept open by a metal hoop. Good separation was obtained, with most of the *Nephrops* ending up in the lower codend and most of the whiting in the top codend. Mixing of the two codend catches in the case of large catches and handling problems on board could prevent acceptance by the industry. On the other hand, less sorting work, a better condition of the marketable roundfish and a possible improvement of the roundfish stock are important advantages of the system.

Bagge, O. (1982) : Selection of *Nephrops* in 70 mm *Nephrops* trawl.

ICES Council Meeting 1982, ICES-CM-1982/B:2.

Selectivity experiments were carried out with a 72 mm *Nephrops* trawl. The covered codend method was used. Results are shown in the next table :

	Mean <i>Nephrops</i> catch (kg/h)	Mean bycatch (kg/h)	L50 (mm)	SF
seatrip 1	6.8	12.5	32.5	0.45
seatrip 2	14.5	25.9	28.7	0.40

The amount of *Nephrops* catch and by-catch seems to be negatively related to L_{50} and selection factor.

Charuau, A., Morizur, Y and Rivoalen, J.J. (1982) : Survie des rejets de *Nephrops norvegicus* dans le Golfe de Gascogne et en Mer Celtique.

ICES Council Meeting 1982, ICES-CM-1982/B:13.

The survival of *Nephrops* discards, caught under commercial conditions, has been studied after an immersion of the animals for 2 to 3 days in cages on the seabed. The survival rate was

31 % for the Bay of Biscay experiments and 19 % for the Celtic Sea experiments.

Hillis, J.P. and Earley, J.J. (1982) : Selectivity in the *Nephrops* trawl.

ICES Council Meeting 1982, ICES-CM-1982/B:19.

Whole trawl selectivity of a standard Irish *Nephrops* trawl was investigated by means of 52 small meshed covers, of which 25 were attached to the lower panel, 25 to the top panel and 2 along the selvedge.

Almost no *Nephrops* were taken in the covers on the top panel and on the selvedges. 48 % of the *Nephrops* catch was retained in the codend, only 10 % escaped from the codend and more than 40 % escaped through the trawl. High amounts of escapes occurred in the wing bases, where the netting shows areas of slack meshes. There also was a noticeable difference between length frequency distributions of *Nephrops* escaping through different parts of the trawl, where peak numbers occur at progressively lower carapace lengths, as one progresses forward from the codend to the wings. The whole trawl selection factor and selection range were 0.37 and 7.6 mm respectively.

Morizur, Y., Charuau, A. and Rivoalen, J.J. (1982) : Survie des langoustines (*Nephrops norvegicus*) s'échappant d'un cul de chalut.

ICES Council Meeting 1982, ICES-CM-1982/B:14.

Nephrops that escaped from a 45 mm mesh codend were returned to the seabed, into cages, to study the survival. After immersion for 60-78 hours, the survival rate was found to be 70 %. There was, however, a linear increase of survival with the size of the animal.

Briggs, R.P. (1983) : Net selectivity studies in the Northern Ireland *Nephrops* fishery.

Fisheries Research, 2, p. 29-46.

In the Northern Ireland *Nephrops* fishery it is common practice to use a large meshed net cover or lifting bag over the codend in order to protect the codend from chafing on the seabed and for safety in lifting the catch on board. The effect of a lifting bag on catch composition has been investigated. The data from the catch comparison experiments indicated that the total number of *Nephrops* caught was greatest when a lifter bag was not used. Also the selectivity data proved that more (mainly smaller) *Nephrops* are retained when a lifter bag is not used. These results are in contrast with theoretical studies which accept that blinding of the codend meshes by the lifter bag reduces codend selectivity. The dimensions of the lifter bag,

however, are important and should have a smaller circumference than the codend itself.

Figueirido, M.J. and Castro, M. (1983) : Studies on the selectivity of *Nephrops* off the Portuguese coast. ICES Council meeting 1983, ICES-CM-1983/K:27

Selectivity experiments were carried out with a 40 mm nylon and a 60 mm polyethylene codend. The values of the selection factor varied between 0.46 and 0.50 for the nylon codend and between 0.40 and 0.54 for the polyethylene codend. No positive correlation was found between selectivity and total catch. The selection range varied between 7.97 and 12.47 mm for the nylon codend and between 7.25 and 17.45 mm for the polyethylene codend.

Bennet, D.B. (1984) : A review of Irish Sea *Nephrops* selection. ICES Council Meeting 1984, ICES-CM-1984/K:5.

The author gives a review of whole trawl and codend selectivity data for *Nephrops* in the Irish Sea, and gives mean selection factors and ranges. The author stresses the importance to consider both whole trawl selectivity and the differences in gear type used, when mesh assessments are made.

Briggs, R.P. (1984) : A review of *Nephrops* mesh selection. ICES Council Meeting 1984, ICES-CM-1984/K:39.

The literature on *Nephrops* selectivity is reviewed. The author gives a description of the methodology for selectivity experiments and the data analysis, and reviews selectivity data and factors affecting *Nephrops* selection and catch.

Charuau, A. (1985) : Expérimentation d'un chalut séparant la langoustine (*Nephrops norvegicus*) du poisson. ICES Council Meeting 1985, ICES-CM-1985/B:38.

A so-called "bigouden" bottom trawl was equipped with a full length separator panel, a lower and an upper codend to study the potential of this system for separating *Nephrops* from the by-catch. In all the experiments around 90 % of the *Nephrops* was caught in the lower codend. In the Bay of Biscay trials 90 % of the hake was taken in the upper codend. However, in the Celtic Sea trials only 48 % of the finfish was caught in the upper codend, but here the by-catches were larger, and they also consisted of larger individuals.

Hillis, J.P. (1985) : Some observations on the separation of *Nephrops* from whiting and other fish by separator trawls. ICES Council Meeting 1985, ICES-CM-1985:B:47.

Experiments were carried out with two types of separator trawl. One being equipped with a panel covering 38 % of the length of the belly and two codends, a second with two codends only. A separation was obtained of 91 to 99 % of the *Nephrops* in the lower codend and of 67 to 98 % of the whiting in the upper one.

Main, J. and Sangster, G.I. (1985) : Trawling experiments with a two level net to minimise the undersized gadoid bycatch in a *Nephrops* fishery. Fisheries Research, 3(1985), p. 131-145.

Experiments were carried out with a fish/prawn trawl equipped with a separator panel of three different mesh sizes and two codends. Underwater observations led to an optimal rigging of the system. The height of the panel above the footrope seemed to be very important. If it was set too high, too much roundfish ended up in the lower codend. The opposite led to unacceptably high proportions of *Nephrops* in the upper codend. A height of 75 cm above the footrope gave the most favourable separation. It was found that many spotted dogfish became meshed in the 85 mm separator panel and during hauling *Nephrops* would pass through the panel into the upper codend. A mesh size of 50 or 70 mm seemed more appropriate.

Briggs, R.P. (1986) : A general review of mesh selection for *Nephrops norvegicus* (L.). Fisheries Research, 4(1986), p. 59-73.

The techniques used in *Nephrops* mesh selectivity studies are described and recent literature on the subject is reviewed. It would appear that *Nephrops* selectivity has a shallow ogive, giving a wide selection range. The various factors affecting selectivity are discussed and the importance of studying whole trawl selectivity is emphasised. Various gear designs are described, and it is concluded that *Nephrops* fishing ideally requires a gear that steepens the selection ogive, releases undersized whitefish and remains economically viable.

Robertson, J.H.B., Emslie, D.C., Ballantyne, K.A. and Chapman, C.J. (1986) : Square and diamond mesh trawl codend selection trials on *Nephrops norvegicus* (L). ICES Council Meeting 1986, ICES-CM-1986/B:12.

The selective properties of a 65 mm diamond, a 67.5 mm square, a 65 mm diamond and a 57 mm square mesh codend have been investigated applying the covered codend method. Netting mate-

rial was single twisted polyethylene. The selectivity parameters are as follows :

Mesh type	Mesh size (mm)	L50 (mm)	SR (mm)
Diamond	65	17.1	17.1
Square	67.6	39.3	19.0
Diamond	65	20.2	16.8
Square	67.6	26.3	50.6
Square	57	29.7	12.1

The low L_{50} of 26.3 mm for the 67.6 mm square mesh codend would be caused by masking of the meshes by the cover due, to a high by-catch of shells.

The square mesh codends show better selectivity characteristics than the diamond mesh. The application of such codends in separator trawls could be beneficial for *Nephrops* selection in the lower codend and for roundfish selection in the upper codend. The author suggests that a horizontally divided square mesh codend could be used by itself with the advantage of being less expensive than a full length separator panel.

**Hillis, J.P. and Carroll, J. (1988) : Further experiments with the separator trawls in the Irish Sea.
ICES Council Meeting 1988, ICES-CM-1988/B:51.**

In order to investigate vertical separation of *Nephrops* and whiting, two commercial trawlers used trawls with a single codend equipped with a separator panel, one of the trawls having separator panel extending forward into the rear part of the body of the trawl. Most percentages of landed catch of *Nephrops* in the lower compartment were in the range 79-87 % whilst percentages of whiting in the upper codend ranged from 74 to 94 %. The panel in the rear part of the trawl body appeared to have little advantage over that confined to the codend. One of the boats took a high percentage of cod in the upper codend in most hauls.

**Nicolajsen, A. (1988) : Estimation of selectivity of a vertically split trawl.
ICES Council Meeting 1988, ICES-CM-1988/B:9.**

Since the method of alternate hauls to determine selectivity parameters requires a considerable number of hauls to obtain reliable results, the author proposes a vertically divided trawl for this purpose which would reduce the variability of the data. One drawback of this method is the uneven catchabi-

lity of the two sides of the trawl due to the higher water resistance of the small meshed net. For a 64 mm mesh codend the selection factor was 0.52 and the selection range was 13.7 mm. Adjusting the data for unequal fishing of both sides of the trawl gave a selection factor of 0.51 and a selection range of 12.8 mm.

Kirkegaard, E., Nielsen, N.A. and Bagge, O. (1989) : Mesh selection of *Nephrops* in 60 and 70 mm *Nephrops* trawl. ICES Council Meeting 1989, ICES-CM-1989/B:32.

In order to estimate the short term losses for the Danish *Nephrops* fleet if the minimum mesh size were increased from 60 to 70 mm, a twin trawl was equipped with a PA 60 and a PA 70 mm codend, and catches were compared. The catch of *Nephrops* below minimum landing size (< 40 mm) was reduced by 32 % and the short term loss of *Nephrops* was estimated to be 14 % in weight. No losses of commercial finfish were recorded. The selectivity parameters are given in the next table :

Mesh size	L50 (mm)	L75 (mm)	SF
60.4	29.1	36.1	0.48
71.3	34.4	41.4	0.48

Hillis, J.P. (1989) : Further separator trawl experiments on *Nephrops* and whiting. ICES Council Meeting 1989, ICES-CM-1989/B:46.

This paper describes trials with a separator trawl, equipped with an upper and lower codend, but without separator panel. The experiments proved that it was possible to obtain over 95 % of the *Nephrops* in the lower and between 70 % and 80 % of the whiting in the upper codend, with the simpler and cheaper system without separator panel.

Thorsteinsson, G. (1991) : Experiments with square mesh windows in the *Nephrops* trawling off South-Iceland. ICES Council meeting 1991, ICES-CM-1991/B:3.

Experiments were conducted aboard a commercial twin trawler to study the effect of a square mesh window in the extension (80 mm mesh) of the net and one further forwards (135 mm mesh) in the top panel, on the bycatch of haddock, whiting and cod. The window in the extension had little effect on the release of haddock, possibly due to the bad visibility in that part of the net. The window inserted in the front part of the net, however, proved to be very effective for haddock, whiting and

even for cod. A second advantage of such window is the decrease of sorting work aboard.

Tumilty, J.E. (1991) : The use of square mesh panels to reduce discarding of white fish from trawls.
ICES Fish. Technol. Fish. Behav. Work. Group Meeting, Ancona, April 1991
Hull, Seafish Industry Authority

The object of the trials was to observe a *Nephrops* trawl fitted with a square mesh window and to make a commercial evaluation of this system in a twin trawl arrangement. The results clearly showed a consistent reduction of whiting and haddock by-catch. The panel, however, did not show any benefits for cod. Important is the fact that no *Nephrops* escaped from the window. To obtain good results, the panel should be no less than 3 m long.

Ulmestrand, M. and Larsson, P. (1991) : Experiments with a square mesh window in the top panel of a trawl
ICES Council Meeting 1991. ICES-CM-1991/B:50

A square mesh window in the top panel of a *Nephrops* trawl was tested as a possible means to reduce bycatch of especially small roundfish in the Swedish *Nephrops* trawl fishery. A twin trawl was used with a 70 mm square mesh window in the upper half of one of the codends, and a 70 mm diamond mesh in the other. The trawl with the square mesh window caught about 62 % less whiting. No significant differences were found for *Nephrops* or flatfish.

Briggs, R.P. (1992) : An assessment of nets with a square mesh panel as a whiting conservation tool in the Irish Sea fishery.
Fisheries Research, 13(1992), p. 133-152.

Flume tank tests and underwater observations indicated that square meshes inserted into a trawl remained open while conventional diamond meshes did close. The observations also showed that there was good escapement of small fish through the square mesh panel in the top panel of the trawl, while no *Nephrops* escapes were observed. These results were confirmed by fishing experiments under commercial conditions.

Larsvik, M. and Ulmstrand, L. (1992) : Square and diamond mesh trawl codend selection on *Nephrops norvegicus* (L.), analyzed with the curve-fit method isotonic regression. ICES Council Meeting 1992, ICES-CM-1992/B:36.

The selectivity parameters of a PP 70 mm diamond mesh and a PA 60 mm square mesh codend were compared by means of the twin trawl method . The results are given in the following table :

Codend	L50 (mm)	SF	SR (mm)
70 mm diamond	26.4	0.38	11.5
60 mm square	40.1	0.66	13.4

Selection curves were calculated using isotonic regression, which is a method without restrictions with respect to the symmetry of the data.

Main, J., Sangster, G.I., Kynoch, R.J. and Ferro, R.S.T., (1992) : An experiment to measure the selectivity of codends using two designs of cover. Scott. Fish. Work. Paper no. 2/92.

Codend selection has been measured with the standard ICES recommended cover and a new design supported with rigid rings. The estimates of the L_{50} increased markedly with the new design, especially for haddock. The effect of the application of a 90 mm square mesh window inserted in a 90 mm codend was measured with the new cover. For whiting, the L_{50} increased from 29.8 to 35.1 cm. Discard reduction was estimated to be 30 %. Inserting an 80 mm square mesh window in a 90 mm codend reduced haddock discards below minimum landing size by 10 %. The landings of marketable fish, however, were reduced by 13 %.

For whiting the selectivity parameters were as follows :

Configuration	Cover type	Mesh size	L50 (cm)	SF	SR (cm)
90 mm codend	Ringed	91.18	29.8	3.26	5.3
90 mm codend	Standard	91.18	28.8	3.14	6.8
90 mm codend + sq. m. window	Ringed	91.18	35.6	3.92	7.3
90 mm codend + sq. m. window	Standard	91.18	32.6	3.58	7.3

Briggs, R.P. and Robertson, J.H.B. (1993) : Square mesh panel studies in the Irish Sea fishery. ICES Council Meeting 1993, ICES-CM-1993/B:20

The effect on the reduction of the by-catches of juveniles of (a) a knotless square mesh panel, (b) a panel from knotted diamond mesh netting turned to be square with and without strengthening ropes, and (c) a large diamond mesh panel, each inserted in a prawn trawl, was studied. TV observations showed that the square mesh window was more effective in releasing small whiting than the large diamond meshes, which were mostly closed. *Nephrops* were almost entirely passive when passing below the square mesh window. They are almost never seen to drift higher than the selvages. The meshes of the large diamond mesh lower panel were never open enough to let *Nephrops* penetrate and escape. Whiting, however, proved to be a positive swimmer. It swims strongly within the trawl extension and codend, it has quite distinct body orientations at the various stages of capture and it makes repeated attempts to escape. The fish almost always try to escape from the top panel.

2.2. Inquiry into the Belgian otter trawler fleet

2.2.1. Introduction

Although most of the Belgian trawler fleet consists of beamers, otter trawling is always still the common practise in a number of particular fisheries. Different types of otter trawls are being used by the Belgian fleet. Most of them, however, are bottom trawls, targeting *Nephrops* or roundfish, such as cod, haddock and whiting.

At the time of the inquiry the Belgian otter trawler fleet consisted of 37 vessels, with an engine power of 221-589 KW. The skippers of 25 of these were questioned on the following topics :

- vessel characteristics :

- length over all,
- gross tonnage and
- engine power.

- fishing gear characteristics :

- type, dimensions, materials and weight of the otter boards,
- length of the headline,
- type and length of the groundrope,
- netting materials and mesh sizes and
- codend dimensions, materials and mesh sizes.

- fishery :

- fishing grounds,
- periods,
- towing speeds,
- target and by-catch species and
- no. of days per voyage.

2.2.2. Otter trawling for

Because of the increasingly tight TACs on roundfish, several Belgian otter trawlers have recently switched to *Nephrops*. Nowadays about two-thirds of the otter trawler fleet practises this fishery. Roughly half of these vessels can be considered as *Nephrops* specialist trawlers, fishing for *Nephrops* on a year-round basis. The others fish for *Nephrops* during a shorter period of time, usually between April and September, when the largest *Nephrops* catches can be taken.

Most Belgian *Nephrops* directed otter trawlers are side trawlers, with an engine power of 221 - 400 KW, operating standard finfish and *Nephrops* trawls. The fleet also comprises one stern trawler, fishing with a Danish type *Nephrops* trawl.

The *Nephrops* trawl is a "traditional" two panel bottom trawl. The length of the headline is fairly similar in all trawls used, with an average of 27 m. The length of the groundrope however, varies more (viz. from 31 to 38 m), mainly because the efficiency of the trawl largely depends on the relationship between vessel characteristics and the length of the groundrope. The central part of the groundrope (\pm 20 m) consists of wire, winded with netting and rope. The outer parts, together with the lower bridles, are made of chain. The upper bridles consist of wire or so-called mixed rope (a combination of polyethylene and steel wire). Both upper and lower bridles usually have a length of 6-7 m. Depending on the state of the seabed, up to three tickler chains may be attached between the otter boards, to lift *Nephrops* from the seabed, thus increasing the catchability of the trawl.

The netting material used, is polyethylene, with a mesh size of 90 mm throughout the net body. The codend is usually made of single braided polyamide and has standard dimensions (100 x 50 meshes).

Only one type of otter board is used, viz. a rectangular wooden board of 430 kg, measuring 2.4 by 1.2 m.

The average towing speed in the *Nephrops* fishery is 3 knots, with a minimum of 2.5 and a maximum of 3.5 knots.

Recently, attempts have been made to introduce new types of fishing gear in the Belgian *Nephrops* fishery. One vessel tried a wide opening Danish *Nephrops* trawl, and currently experiments are carried out with a Danish twin trawl.

Fishing grounds visited include the Botney Gut and the Silver Pit in ICES Sub-area IV_{b-c}, and, since a few years, *Nephrops* grounds north of the Terschellingerbank. Vessels usually stay at sea for 12 days.

2.3. Steering group meetings

The first project meeting took place on February 11th, at the Fisheries Research Station (RvZ) in Ostend. Two scientists of DIFTA and two scientists of RvZ attended the meeting. The scheduling of the project was discussed. Particular attention was paid to the methodology for both the selectivity and the discard experiments at sea: design of nets and codend covers, sampling protocols, species to be investigated, measurements to be taken, etc.

The second project meeting, on September 15th, was held at DIFTA in Hirtshals. Two scientists of DIFTA and one scientist of RvZ attended the meeting. The results of the experiments carried out by the two institutes were thoroughly discussed, and agreements were made on the methods and the software to be used for the data analysis.

3. Methodology

3.1. Introduction

Commercial fishermen in general had a positive attitude towards cooperation in the project, which highly facilitated the chartering of a representative vessel. The final option was for the O.306 "CLEANER", owned by BVBA Rathé - Kiekens, Vanhembdenstraat 45, B-8400 Oostende. This vessel has a length over all of 27 m, a gross tonnage of 98 GT and an engine power of 276 KW, and is part of the fleet which is almost year-round directed towards *Nephrops*.

The owner of the O.306 frequently collaborates with the RvZ during research cruises on the oceanographic research vessel "BELGICA", and is fully aware of the problems which can arise during experiments at sea. This proved to be an advantage, especially in the preparation of the experiments.

3.2. Time schedule of the experiments

Because of the rather poor catches rates of *Nephrops* during winter and spring, the experiments were scheduled to take place between May and October 1993.

During the first trip, from June 1st to June 13th, selectivity experiments were carried out on *Nephrops* and whiting, with a standard 70 mm codend, a 70 mm codend with a square mesh window, and a 90 mm codend.

The second trip, from June 17th to June 29th, included selectivity experiments with a standard 70 mm codend, and length frequency measurements of the landings and discards. The discard studies were focused on *Nephrops*, whiting, cod, gurnards, dab, plaice and sole.

During the last trip, from August 28th to September 9th, only discard studies were carried out, together with survival experiments on the discards of small *Nephrops*.

3.3. Fishing gear

All experiments were done with a standard commercial *Nephrops* trawl. The selectivity data were collected using the covered codend technique. Trawl dimensions and gear parameters, measured by means of SCANMAR equipment, are shown in Figures 3.3.1. and 3.3.2.

The overall mesh size of the net body was 90 mm. The netting material was polyethylene, double braided in the lower panel, except for the wing tips, and single braided in the top panel.

The codends tested (70 and 90 mm) were identical to the ones used in the commercial fishery, and had standard dimensions of 100 meshes round and 50 meshes deep. Codend and cover mesh sizes were measured on several occasions during the experiments, by means of an ICES gauge set at a tension of 4 kg. The mean wet mesh size was 67.3 mm for the "70 mm" polyamide codend, and 79.0 mm for the "90 mm" polyethylene codend. The mean wet mesh size of the codend cover was 37.1 mm. When measured with a wedge gauge, the meshes all proved to be well above the mesh size guaranteed by the manufacturer, viz. 70 and 90 mm for the codends, and 40 mm for the cover. The 70 mm polyamide codends are always still used in the commercial fishery, mainly because polyethylene codends, which are generally preferred by the fishermen, are not available in that mesh size.

3.4. Selectivity experiments

3.4.1. Technical aspects and sampling protocol

Before the start of the experiments, different types of covers were tested out on the RV "BELGICA". The possibility of using hoops in combination with the codend cover was explored, in order to reduce the masking effect of the cover. For several reasons, however, this option was abandoned. The handling of such a cover on the relatively small O.306 was expected to be too problematic, and the risk that the gear would get stuck in the mud layer on the seabed was considered too high.

As an alternative a new type of codend cover with two rows of small floats on the top panel was designed. Preliminary tests in the flume tank of IFREMER in Boulogne (France), showed that the cover was well away from the codend, except for the lower half of the codend, where the catch accumulates to a bulbous mass. Therefore, some masking of the meshes could not be excluded. During the first hauls on the first sea trip, attempts were made to solve this problem by attaching a half hoop to the top panel of the codend cover. Handling problems while shooting and hauling the gear, however, showed that this solution was impractical, and the hoop was removed again.

During commercial fishing operations, the lower panel of the codend is protected with so-called "chafers". As a rule these chafers were removed during the selectivity experiments, to avoid extra blinding of the "chafered" codend meshes by the equally "chafered" codend cover. However, additional selectivity experiments with a "chafered" codend were carried out

during the second sea trip, to evaluate the effect of removing the codend chafers.

The sampling protocol for the selectivity experiments is summarized in Figure 3.3.1.1. Fractions sampled and measured are marked with a ■.

The volume of each fraction in the codend catches (whole *Nephrops*, *Nephrops* to be tailed, commercial fish and "trash") was measured in baskets (ca. 40 litres) or 20 litre buckets, after having been sorted by the ship's crew. The discards were then sorted by the scientific crew, from 2 baskets of "trash" taken from each haul. Larger fractions were sub-sampled.

From the catches in the codend cover 1 or 2 baskets were kept for sorting by the scientific crew.

Whenever possible $\frac{1}{2}$ to 1 basket of whole *Nephrops*, and $\frac{1}{4}$ to $\frac{1}{2}$ basket of *Nephrops* to be tailed were measured. As a rule, neither the *Nephrops* samples from the cover, nor the whiting fractions in the landings or discards were sub-sampled. The whiting samples taken from the cover were sub-sampled when their volume exceeded 20 litres.

Fish were measured with a ruler to the cm below, and *Nephrops* with callipers to the nearest mm carapace length (CL). *Nephrops* to be tailed were measured whole, i.e. before tailing.

3.4.2. Data processing

For the time being, it was assumed that the selection ogives could be represented by a symmetrical logistic curve (Pope et al., 1975):

$$r(l) = \exp(\alpha * l + \beta) / (1 + \exp(\alpha * l + \beta))$$

where $r(l)$ = the probability for a fish of length l to be retained by the codend tested,

l = the length class,

α and β = the constants determining the shape of the selection curve.

An iterative maximum likelihood routine was used to calculate the best fitting values for α and β , starting from the numbers retained in the codend and the codend cover. The goodness of fit of the curve was judged from the deviance. Under certain assumptions the deviance is Chi-square distributed, with $n-2$

degrees of freedom, where n is the number of length classes with at least 5 measurements in both the codend and the codend cover.

For *Nephrops*, selection curves were calculated for each haul separately but the goodness of fit of these curves varied widely, depending, amongst others, on the number of length classes in the samples and on the number of measurements in each size class. Pooled hauls, on the other hand, usually give a much better fit of the selection curve. Mean selection curves were derived from the combined numbers at length from hauls made under similar conditions. In this case, however, the confidence limits do not reflect the real level of uncertainty (Fryer, 1991) and therefore they are not quoted in the results section.

For whiting, the retention rates for single hauls were too dispersed to allow the calculation of individual selection curves, mainly because the numbers of larger fish in the catches were too low. Only the pooled data-sets were used to determine the selectivity parameters, and again it was decided to disregard the confidence limits.

The mesh size of the cover was large enough to let some smaller *Nephrops* and fish escape. Consequently, the numbers in the cover, especially for the smallest length classes, were underestimated as compared to the real numbers of animals escaping from the codend (Fonteyne, 1991). This, in turn, would have resulted in pushing down the L_{25} , and in increasing the selection range. To compensate for this, the numbers retained by the cover were corrected by means of the expected retention rates for each size class. The "expected retention" rates for the cover were calculated from the following equation:

$$r(l) = \frac{1}{1 + e^{-(\alpha * l + \beta)}}$$

After transformation this equation becomes:

$$\ln\left(\frac{r(l)}{1-r(l)}\right) = \alpha * l + \beta ,$$

and α and β can be calculated as:

$$\beta = \frac{2 \ln 3}{L_{75} - L_{25}} \quad \text{and} \quad \alpha = \beta * L_{50}$$

where L_{25} , L_{50} and L_{75} are the lengths at 25, 50 and 75 % retention. $L_{75}-L_{25}$ is the selection range, and L_{50} can be derived from $L_{50} = \text{selection factor} * \text{mesh opening}$.

The selectivity parameters used in these calculations were taken from Wileman (1991):

Nephrops : selection factor: 0.37
 selection range : 12 mm

Whiting : selection factor : 3.12
 selection range : 7.3 cm

3.5. Discard studies

3.5.1. Sampling protocol

The sampling protocol for the discard studies is summarized in Figure 3.4.1.1. Fractions sampled and measured are marked with a ■.

The volume of each fraction in the landings (whole *Nephrops*, *Nephrops* to be tailed and commercial fish), and the total volume of the so-called "trash" (including *Nephrops* and by-catch fish to be discarded), was measured in baskets (ca. 40 litres) or 20 litre buckets, after the catch had been sorted by the fishermen. The discards (*Nephrops* and by-catch fish) were then sorted by the scientific crew, from 2-4 baskets of "trash" taken from each haul (1 or 2 baskets from each side of the sorting table, depending on the numbers of *Nephrops* and by-catch fish contained in the "trash"). Larger fractions were sub-sampled.

Whenever possible $\frac{1}{2}$ to 1 basket of whole *Nephrops*, and $\frac{1}{4}$ to $\frac{1}{2}$ basket of *Nephrops* to be tailed were measured. As a rule the commercial fish fraction (viz. whiting, cod, gurnards, dab, plaice and sole) was not sub-sampled.

Fish were measured with a ruler to the cm below, and *Nephrops* with callipers to the nearest mm carapace length (CL). The length measurements of *Nephrops* were recorded for males and females separately, and, for the females, by reproductive stage (non-berried, berried and hatching).

3.5.2. Data processing

The numbers of *Nephrops* and by-catch fish measured were first raised to total numbers per standard haul of 3½ hours, using raising factors based on the ratio between the total volume of each fraction in the catches and the volume of the corresponding sample.

These data were then grouped into so-called "data-sets" of six standard hauls each (taken within a period of approximately 48 hours), which were chosen such that they covered a full period of 24 hours. The numbers thus calculated give an idea on the total numbers of *Nephrops* and by-catch fish landed or discarded per day.

Fishermen's selection curves for *Nephrops* and by-catch fish were calculated using the ConStat package.

For *Nephrops* and whiting the data-base was sufficiently large to allow the calculation of selection curves for each data-set of 6 standard hauls separately.

For the other species, however, either the numbers landed (dab and gurnards) or the numbers discarded (cod, plaice and sole) were generally too small to produce reliable fishermen's selection curves on a 24 hours basis. Therefore, the data for cod, gurnards, dab, plaice and sole were pooled into one single data-set, including 36 standard hauls of 3½ hours each (viz. 18 hauls from the June sampling campaign and 18 hauls from the September sampling campaign).

3.6. Discard survival experiments

During the September sampling campaign, 10 experiments were carried out to collect information on the survival of discarded *Nephrops*.

For each of these experiments 50 undersized *Nephrops* were taken at random from the discards and transferred to a 150 litres plastic container, where they were kept under a constant, gentle flow of sea-water.

After approximately 1 hour the animals were removed from the container, they were sexed and measured, and their condition was recorded (alive, poor and moribund or dead), together with any signs of external damage (1 or 2 claws missing, carapax and/or abdomen damaged). The appreciation of the condition was based on several criteria, such as locomotory activity and the way they held their claws. In case of doubt the animals were gently turned on their back: those which promptly rolled over again were then considered as being alive, those which only

very slowly turned over as being in poor condition, and those which failed to turn over as being moribund or dead.

4. Narratives

4.1. Sampling campaign 1 (01.06-13.06.93)

The O.306 "CLEANER" left Ostend harbour on June 1st, around 11.00 a.m.. After 17½ hours steaming she reached the Silver Pit *Nephrops* grounds on June 2nd, around 4.30 a.m..

Fishing operations started on June 2nd, at 5.30 a.m., in the north-eastern part of the Silver Pit.

Between June 2nd 5.30 a.m. and June 6th 1.00 a.m., 22 hauls were made with a standard *Nephrops* trawl, equipped with a 70 mm codend and a 90 mm square mesh window in the rear part of the top panel of the net, immediately in front of the codend. The codend cover was attached to the net, such that it covered both the square mesh window and the codend. Extra floats were fitted to the top panel of the cover, to keep the netting clear from the window, and to avoid masking of the square meshes. During the first haul the efficacy of the cover was checked and some minor adjustments were made to the shooting and hauling operations. 11 hauls were selected for the selectivity studies on *Nephrops* and whiting (Tables 4.1.1. - 4.1.5.).

On June 6th the square mesh window was removed and replaced by "normal" diamond mesh netting. The position of the codend cover with respect to the codend itself was not altered. Fishing operations were resumed at 3.00 a.m. Between June 6th 3.00 a.m. and June 8th 12.00 a.m., 14 hauls were made, out of which 6 were selected for the selectivity studies (Tables 4.1.1. - 4.1.5.).

On June 8th 0.30 p.m. the SCANMAR equipment was attached to the trawl, and measurements were made on the net-parameters under different conditions of towing speed and direction.

On June 8th 3.30 p.m. the SCANMAR equipment was removed from the trawl, and the 70 mm codend was replaced by a 90 mm codend. The codend cover was shortened and attached to the same row of meshes as the codend. Fishing operations were resumed at 4.00 p.m. Within the next three days, 15 hauls were made. Out of these 9 were selected for the selectivity studies (Tables 4.1.1. - 4.1.5.).

Since the catches had been rather poor until then (which was feared to put to heavy a burden on the budget available for chartering), it was decided to switch to the Botney Gut *Nephrops* grounds, where the catch rates were expected to be higher. Because of the large amounts of heavy mud in the Botney Gut area, however, trawling with a small mesh codend cover was no longer possible. Between June 11th 5.30 a.m. and

June 12th 10.00 p.m., 10 hauls were made with the 70 mm cod-end, without cover.

Fishing operations were terminated on June 12th 10.00 p.m., upon which the vessel returned to port.

The O.306 "CLEANER" moored in Ostend harbour on June 13th, at 5.00 p.m. Around 6.00 p.m. unloading of the scientific equipment and the *Nephrops* samples, not measured at sea, was completed. The samples were transferred to the Institute and stored in a freezer for further analysis at a later date.

In total 62 hauls were made during this trip, mostly in the Silver Pit.

4.2. Sampling campaign 2 (17.06-29.06.93)

The O.306 left Ostend harbour on June 17th, around 11.30 a.m. After 16 hours steaming she reached the Botney Gut *Nephrops* grounds, but because of adverse weather conditions, the skipper decided to continue for the Silver Pit, 35-40 miles further to the North.

Fishing operations started on June 18th, at 8.00 a.m., in the north-western part of the Silver Pit. Between June 18th 8.30 a.m. and June 22nd 8.00 a.m., 24 hauls were made with a standard *Nephrops* trawl with a 70 mm codend. Out of these 14 were selected for the analysis of the discards of both *Nephrops* and commercial fish (Tables 4.2.1. - 4.2.10.).

On June 22nd the chafers were removed from the codend, and the codend cover was attached to the trawl. Fishing operations were resumed at 9.30 a.m. Between June 22nd 9.30 a.m. and June 25th 12.00 p.m., another 21 hauls were made, out of which 10 were selected for the selectivity studies on *Nephrops* and whiting (Tables 4.2.1. - 4.2.10.).

On June 26th the chafers were again attached to the codend, while the codend cover was left in place. Between June 26th 1.00 a.m. and June 28th 10.00 p.m., a final 16 hauls were made, of which 10 were selected for the analysis of the discards and/or the selectivity studies (Tables 4.2.1. - 4.2.10.).

Fishing operations were terminated on June 28th, around 10.00 p.m., upon which the vessel returned to port.

The O.306 moored in Ostend harbour on June 29th, at 6.00 p.m. Unloading of the scientific equipment was completed by 7.00 p.m. Discard and codend cover samples, not measured at sea, were transferred to the Institute and stored in a freezer for further analysis.

In total 60 hauls were made during this voyage, mostly in the Silver Pit.

4.3. Sampling campaign 3 (28.08-09.09.93)

The O.306 left Ostend harbour on August 28th, around 12.00 a.m. After 15 hours steaming she reached the fishing grounds West of the Sole Pit, where it was agreed to fish for rays, dogfish and spurdog for 2 or 3 days. Fishing operations started on August 29th, at 5.00 a.m. In total 20 hauls were made.

Finfish directed trawling was terminated on September 1st, at 10.00 a.m., upon which "CLEANER" steamed to the Silver Pit. *Nephrops* directed trawling was started the same day, at 2.15 p.m.

Between September 1st, 2.15 p.m. and September 9th, 5.00 p.m. 42 hauls were made with a standard *Nephrops* trawl. Out of these 18 were selected for the length frequency analysis of the landings and the discards of *Nephrops* and commercial fish (Tables 4.3.1. - 4.3.10.). On 10 occasions survival-experiments were performed on small *Nephrops*, taken at random from the discards.

Apart from the discard studies, the original sampling schedule also included a 24 hour cycle, to be carried out on the last two days of the voyage. Because of unstable weather conditions, which were expected to adversely affect the catchability of the trawl, this part of the programme had to be cancelled. Instead, data were collected on the sexual maturity of female *Nephrops* (see Table 4.3.1. - 4.3.4., hauls 56 and 60).

Fishing operations were terminated on September 8th, around 5.00 p.m., upon which the vessel returned to port.

The O.306 moored in Ostend harbour on September 9th, at 4.30 p.m. Unloading of the scientific equipment was completed by 6.30 p.m. Discard samples, not measured at sea, were transferred to the Institute.

5. Results and discussion

5.1. Selectivity studies

The investigations on gear geometry and behaviour by means of the SCANMAR equipment showed that the horizontal opening of the net, measured between the otter boards, was 19 m and the vertical opening 1 m. These parameters were very stable and almost independent from water depth and current direction.

In technical terms, the codend cover performed well under different conditions with respect to weather, sea state, etc., and no data sets had to be rejected for reasons of inconsistency. However, some masking of the codend meshes by the cover could have taken place, and, as a consequence, the selection factors might be slightly underestimated.

5.1.1. *Nephrops*

The length frequency distributions and the selection curves for each haul are shown in Figures 5.1.1.1-5.1.1.88. The plots for the pooled hauls are given in Figures 5.1.1.89.-5.1.1.106. Tables 5.1.1.1. (a) and (b) summarize the selectivity parameters.

5.1.1.1. Haul by haul comparison

The length frequency plots clearly show that each single haul contained sufficient numbers of *Nephrops*, particularly within the selection range, to obtain reliable retention rates at length. This is also reflected by the low degree of scattering of the retention rates around the selection curves for most hauls. However, both the smallest and the largest size classes of *Nephrops* were sometimes caught in very low numbers, which resulted in a considerable degree of scattering of the retention rates in the outer parts of the size range. Especially the smallest *Nephrops* may have escaped underneath the footrope or through the trawl wings and body, long before they could reach the codend (Hillis and Earley, 1982).

The haul by haul variability of the selection factor is quite large. The data indicate that at least part of this variability was attributable to the weather conditions (see Section 5.1.1.2.). Special attention was paid to the volume of the catches, and to the amount of trash therein, but no correlation could be found between the selection factor or range, and the volume of the catches.

5.1.1.2. Effect of sea state on selectivity

The appreciation of the sea state was based on Douglas' sea scale. During the experiments five states of sea were recorded, viz. calm, smooth, slight, moderate and rough, and the data were pooled accordingly. The selection curves, calculated for each sea state, are compared in Figure 5.1.1.107. Figure 5.1.1.108. shows the selection factors in relation to sea state. The graphs reveal a clear positive relationship between selectivity and sea state : the rougher the surface of the sea, the better the selectivity. The relationship between selection range and sea state, on the other hand, is not evident.

Briggs and Robertson (1993) found that *Nephrops* is largely inactive during the catching process and that it makes no active attempts to escape from the trawl. External factors, however, such as pumping movements of the net, which may provoke the opening and closing of the meshes, could induce the escapement of *Nephrops* from the codend. Vessel motion, which clearly depends on sea state, will certainly create such an effect. This is particularly the case during the hauling operation, when the trawl is heaving up and down alongside the vessel.

The present data also lead to such a conclusion. With calm weather, selection was very poor (SF = 0.36, sea state "calm") but as soon as the waves grew higher, selection started to improve (SF = 0.56, sea state "rough").

5.1.1.3. Selectivity parameters of the 70 mm codend

The data for all hauls with the 70 mm codend were combined to produce a "mean" selection curve (Figure 5.1.1.106.). The L_{50} thus obtained was 29.4 mm, the selection factor 0.44, and the selection range 20.4 mm.

Since the weather conditions have a major impact on the selectivity parameters, it seemed reasonable to tune the selectivity parameters according to the prevailing weather conditions in the Botney Gut - Silver Pit area. Wind speed data for the Botney Gut - Silver Pit area, based on recordings from the "Viking Alpha" platform, were obtained from the UK Meteorological Office, Marine Advisory and Consultancy Service. From these data "moderate" appeared to be the prevailing sea state in the area. The selectivity parameters corresponding to this sea state, viz. an L_{50} of **34.4 mm**, a selection factor of **0.51** and a selection range of **15.5 mm**, are a far more realistic estimate of the "true" selectivity parameters than the ones derived from the pooled data. The L_{25} of **26.7 mm** is very close to the Minimum Landing Size (25 mm), which indicates that the

selective properties of the standard codend are in line with the general principle that the L_{25} should be at, or at least close to, the Minimum Landing Size.

5.1.1.4. The square mesh window

The selection factors and ranges for the pooled hauls with and without square mesh window were 0.46 and 19.1 mm, and 0.44 and 20.4 mm respectively. There is no strong evidence that *Nephrops* escape through the window. These findings are in line with the results of previous studies (Thorsteinsson, 1991, Tumilty, 1991, Ulmestrand et al., 1991, Briggs, 1992, Briggs et al., 1993). Most likely, the small difference in selectivity parameters between the two data-sets was due to differences in the weather conditions during the experiments.

5.1.1.5. Comparison between the 70 mm and the 90 mm codends

The L_{50} 's and the selection ranges were 29.4 mm and 20.4 mm for the 70 mm codend, and 27.6 mm and 19.5 mm for the 90 mm codend, actually meaning that an increase of the mesh size would reduce the L_{50} . This is exactly the opposite of what was expected. Two possible explanations can be advanced :

- the relatively rough weather conditions during the hauls with the 70 mm codend, as compared to those with the 90 mm codend, could have lead to an increase in escapement and hence to a better selection in the case of the 70 mm codend and
- the material used for the 90 mm codend (double braided polyethylene) is much more rigid than the single braided polyamide used for the 70 mm codend, and this may have adversely affected the opening of the meshes.

For the time being, however, no firm conclusions can be drawn on the selective properties of the different mesh sizes and on the effect of the netting material thereon. Additional experiments, under comparable weather conditions, are needed to confirm the possible negative effect of double braided polyethylene on *Nephrops* selectivity.

It is important to stress that the choice of the netting materials for the two codend mesh sizes was based on the knowledge, that fishermen would definitely choose for double braided polyethylene if the minimum mesh size would be increased.

5.1.1.6. Comparison with previous *Nephrops* selectivity studies

The selection factors for codends used in other ICES Sub-areas are shown in Figure 5.1.1.110. The variability of these data is very high, even within one ICES Sub-area. The selectivity of the standard 70 mm codend compared fairly well with the mean of these data. The selection factor of the 90 mm codend, however, was low as compared to the others.

5.1.2. Whiting

Table 5.1.2.1. summarizes the selectivity parameters. The selectivity curves for the pooled hauls are given in Figures 5.1.2.1.-5.1.2.6.; the length frequency distributions for each haul separately shown in Figures 5.1.2.7-5.1.2.51.

5.1.2.1. The 70 mm codend

Figure 5.1.2.1. clearly shows that almost all fish below the Minimum Landing Size (23 cm) escaped from the codend. The L_{25} was 24.4 cm, which is slightly above the Minimum Landing Size. As for *Nephrops*, the selective properties of the 70 mm codend for whiting comply reasonably well with the general principle that the L_{25} and the Minimum Landing Size should be at the same length. The selection factor was 4.1 and the selection range 6.8 cm.

5.1.2.2. Standard trawl vs. square mesh window

Below the Minimum Landing Size roughly the same proportions of fish were retained in both the standard trawl (Figure 5.1.2.1.) and the trawl with the square mesh window (Figure 5.1.2.2.). Above the Minimum Landing Size, however, more whiting seemed to escape from the configuration with the window. Similar conclusions can be drawn from the selectivity parameters. The L_{25} , the L_{50} and the L_{75} increased by 2, 4 and 6 cm respectively, upon the insertion of a square mesh window, and, as a consequence, the selection range for the window trawl was considerably larger than that for the standard trawl.

Several previous studies have shown that a square mesh window is particularly effective in reducing the roundfish by-catches. It should be kept in mind, however, that, at least in this case, the extra escapes included mainly marketable fish.

5.1.2.3. Comparison between the 70 mm and the 90 mm codends

From the frequency plots and the selection curves (Figures 5.1.2.1., 3, 4 and 6) for the 70 mm and the 90 mm codends it is clear that selection does not improve with the use of a 90 mm codend. On the contrary: particularly in the lowest part of the length range (below the Minimum Landing Size) relatively more whiting were retained by the 90 mm codend than by the 70 mm codend. Again, it must be stressed that the netting material of the 90 mm codend was double braided polyethylene, for which it seems logical to have a worse selectivity than for single braided polyamide. The L_{50} for the 90 mm codend was 27.5 cm, and the selection factor 3.48. The selection range of 11.6 cm (as compared to only 6.8 cm for the standard codend) also indicates that the selection by the 90 mm codend was much poorer than that of the 70 mm codend.

5.2. Discard studies

5.2.1. *Nephrops*

5.2.1.1. Numbers discarded and landed per day

The total numbers of *Nephrops* (males and females combined) discarded and landed per day during the two sampling campaigns are shown in Figure 5.2.1.1. (see Tables 4.2.11. and 4.3.11. for a list of the hauls comprised in each data-set).

The total numbers of *Nephrops* taken per haul varied considerably within each sampling campaign and within each data-set of six standard hauls, depending on the time of day and the location of the hauls (cf. Tables 4.2.4. and 4.3.4.).

Most striking was the difference between the two sampling campaigns in the numbers of *Nephrops* taken : from June (Campaign 2) to September (Campaign 3) the average number of *Nephrops* caught per day increased by a factor of ≈ 10 . Over the same period of time the numbers landed increased by ≈ 6 and the numbers discarded by ≈ 23 (Figure 5.2.1.1.).

Peak values in the numbers discarded and landed per day were recorded in the last data-set of Campaign 3 (C3 S3 in Figure 5.2.1.1.), with values of $\approx 60 \cdot 10^3$ and $\approx 40 \cdot 10^3$ respectively.

The length frequency distributions of discards and landings (males and females separately) are shown in Figures 5.2.1.2. - 5.2.1.9. for the June sampling campaign, and in Figures 5.2.1.10. - 5.2.1.17. for the September sampling campaign.

5.2.1.2. Fishermen's selection

The fishermen's selection curves (giving the proportions of *Nephrops* retained by the crew, to be landed either whole or as tails) for males and females separately are shown in Figures 5.2.1.18. - 5.2.1.25. for the June campaign, and in Figures 5.2.1.26. - 5.2.1.33. for the September campaign.

For each data-set four selection curves were calculated, viz. the Logit, the Probit, the Complex Log-Log (referred to as C Log Log in the Figures) and the Log-Log curve. The curve which best fitted the observed retention rates is shown as a bold, solid line in the plots ; alternatives, which gave a more or less equally good fit are shown as thin, solid lines ; the others as dashed lines. The parameters α and β , and the L_{50} 's are summarized in Table 5.2.1.1.

In general, fishermen's selection on the males was much sharper than on the females. The selection curves for the males are much steeper than those for the females, especially for the size classes above the L_{50} . In most cases fishermen's selection on the males could best be described by means of a symmetrical Logit or Probit curve, whereas the asymmetrical Complex Log-Log curve usually gave the best fit for the females.

There are several reasons for this difference. During the June campaign large numbers of females were in a soft condition and discarding was often considerable, especially amongst the largest individuals (see Figures 5.2.1.19. and 5.2.1.23.). During the September campaign however, discarding was closely related to the developmental stage of the female gonads. Large females with fully developed gonads are claimed to have a short shelflife, even when kept on ice, and therefore many of them were discarded.

The selection curves for all data-sets are compared in Figures 5.2.1.34. and 5.2.1.35. for males and females respectively. These figures reveal a striking difference in discarding practice between the two sampling campaigns. In June, when the quantities of *Nephrops* caught were small, the L_{50} 's for both males and females were around 28 mm (i.e. only 3 mm above the Minimum Landing Size of 25 mm). In September, however, when the catches were much larger, the selection curves clearly shifted to the right, and the L_{50} 's increased by about 5 mm, to values between 32 and 34 mm.

5.2.1.3. Whole *Nephrops* vs. *Nephrops* tails

The proportions discarded, landed whole and landed as tails, for each size class of males and females in the catches, are

shown in Figures 5.2.1.36. - 5.2.1.43. for the June sampling campaign, and in Figures 5.2.1.44. - 5.2.1.51. for the September campaign.

The overall proportions of the females landed as tails (i.e. all data-sets and all size classes combined) differed markedly between the two sampling campaigns : in June on average 80 % of the females were tailed, as opposed to only slightly over 40 % in September. As for the discards (see Section 5.2.1.2.), the main reason for this difference was related to the occurrence of much larger numbers of soft females in June than in September.

Compared to the females, the relative proportions of male *Nephrops* landed as tails remained fairly stable : on average 36 % in June and 32 % in September.

For the males tailing was mostly confined to the smallest size classes (less than 35 mm) in the landings (Figures 5.2.1.36. - 5.2.1.50.). A similar pattern was observed for the females in the September samples. The June samples however, showed a completely different picture, with peak values in the proportions of female *Nephrops* landed whole around 40 mm, and with most of both the smallest and the largest animals being tailed (Figures 5.2.1.37. - 5.2.1.51.).

5.2.2. By-catch fish

5.2.2.1. Numbers discarded and landed per day

The total numbers of whiting, cod, gurnards, dab, plaice and sole discarded and landed are presented in Figures 5.2.2.1. - 5.2.2.6. for all data-sets combined (see Tables 4.2.11. and 4.3.11. for a list of the hauls comprised in each data-set).

As for *Nephrops*, the quantities of by-catch fish taken varied considerable from one haul to another, depending on the time of the day and the location of the hauls.

It should be stressed that, in general, the numbers of under-sized cod, plaice and sole discarded by the *Nephrops* trawlers are very small, viz. < 40 cod, < 70 plaice and < 40 sole per day (Figures 5.2.2.2., 5.2.2.5. and 5.2.2.6. respectively).

Conversely, the numbers of whiting and dab discarded were sometimes extremely high, depending on both the location of the hauls and the time of the year. For whiting, values exceeding $3.5 \cdot 10^3$ discards per day were observed throughout Campaign 3 (Figure 5.2.2.1.), and for dab, values exceeding $8.0 \cdot 10^3$ discards were noted during both sampling campaigns,

particularly in the north-western part of the Botney Gut (Figure 5.2.2.4.).

For gurnards too the numbers discarded by far exceeded the numbers landed (Figure 5.2.2.3.) but this was, at least in part, due to the fact that in Belgium there is no market for small gurnard.

The length frequency distributions of the discards and the landings are given in Figures 5.2.2.7.-5.2.2.14. for whiting, in Figures 5.2.2.15.-5.2.2.16. for cod, in Figures 5.2.2.17.-5.2.2.18. for gurnards, in Figures 5.2.2.19.-5.2.2.26. for dab, in Figures 5.2.2.27.-5.2.2.28. for plaice, and in Figures 5.2.2.29.-5.2.2.30. for sole. The distributions for whiting and dab are shown for each data-set of six standard hauls separately ; those for the other species by sampling campaign.

5.2.2.2. Fishermen's selection

The fishermen's selection curves for whiting are shown in Figures 5.2.2.31. - 5.2.2.39. for each data-set and sampling campaign separately.

As already pointed out in Section 3.5.2. the numbers landed and/or discarded of cod, gurnard, dab, plaice and sole, were too small to yield reliable selection curves for individual data-sets. The selection curves for these species were calculated from the data for all hauls in the six data-sets combined, and are given in Figures 5.2.2.40. - 5.2.2.44.

For cod, dab, plaice and sole, where the raw data suggested a very sharp and (almost) symmetrical selection pattern, only the Logit and the Probit curves are presented. For whiting, where the raw data were clearly asymmetrical, the calculations were complemented with the Complex Log-Log curve, and for gurnards with both the Complex Log-Log and the Log-Log curve.

The parameters α and β , and the L_{50} 's for these curves are summarized in Table 5.2.2.1. for whiting, and in Table 5.2.2.2. for the other species.

The selection curves for cod, dab, plaice and sole are very steep, with an L_{50} close to (cod, plaice and sole) or clearly above (dab) the Minimum Landing Size.

The curves for gurnards are slightly smoother, with an L_{50} of ≈ 27.5 cm (there is no Minimum Landing Size for gurnards in ICES Sub-area IV).

The selection curves for whiting are mostly asymmetrical, with a gentle curvature between the lengths at 0 % and 25 % retention, and a sharp bend in the area just below the length at

100 % retention. It is especially worth noting that all selection curves have an L_{50} and even an L_{25} which is at least 5 cm and sometimes even as much as 10 cm above the Minimum Landing Size of 23 cm.

As for *Nephrops*, the fishermen's selection curves for whiting clearly shifted to the right from June to September (Figure 5.2.2.39.). In this case however, the shift cannot be explained by an increase in the catches of marketable whiting. The numbers of whiting actually landed were even lower in September than in June (viz. 150 per day as opposed to 320 per day). Both the poor demand for whiting on the local market (which resulted in very low auction prices throughout most of the summer), and the increased work load on board of the vessel (with sometimes hundreds of kilograms of raw catch to be sorted), however, may have driven the crew to retain only the largest, most valuable whiting during the September campaign.

The data clearly show that fishermen's selection for whiting and dab is primarily driven by the size requirements on the local market, and not by the Minimum Landing Size.

5.3. Discard survival experiments

The length distributions of the *Nephrops* used in the survival experiments are plotted in Figure 5.3.1. for each experiment separately, and in Figure 5.3.2. for all experiments combined.

At the end of the experiments, 257 or 51.4 % of the animals were still alive; 77 or 15.4 % were considered as being in poor condition; and 166 or 33.2 % as being moribund or dead (Figure 5.3.3.).

Figure 5.3.4. is based on the same data as Figure 5.3.3. but in this graph the number of individuals in each so-called "damage class" (no damage, 1 claw missing, 2 claws missing, carapax and/or abdomen damaged) is given as a percentage of the total number of individuals in each "condition class" (alive, poor, moribund/dead). The graph clearly shows the relationship between damage and discard mortality, with the highest proportions of non-damaged animals being found amongst the "survivors", and the highest proportions of badly damaged animals being found amongst the moribund or dead *Nephrops*.

A rather pessimistic approximation of the immediate survival rate of the discards -- based on the assumption that none of the damaged animals and none of the animals which are in a poor condition would survive discarding -- gives a value of about 40 %. The fact, however, that about 4 % of the *Nephrops* in the size classes 30-35 mm shows obvious signs of claw regeneration (Redant, unpubl. data), suggests that at least some

of the animals which lost 1 claw in the catching and sorting process may survive discarding.

Even the "pessimistic" estimation of the immediate survival rate of 40 % is still considerably higher than the figure of 30 % reported by Guéguen and Charuau (1975) for the survival of *Nephrops* discarded in the Bay of Biscay. Differences in meteorological and/or technical conditions may have contributed to the observed differences in survival rate, but the most likely explanation seems to be the difference in size of the discards. Although Guéguen and Charuau did not produce length frequency distributions of the discards in their experiments, it appears that most of their *Nephrops* had a size of 11-25 mm only, which is clearly smaller than the size of the animals in the present experiments. Even though the number of *Nephrops* with a size of 16-25 mm in the present study was too small to be conclusive, the results at least suggest that the survival rate is size-dependent, with the lowest values being observed for the smallest size classes.

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Table 4.1.1. - Summary of hauls made during Sampling Campaign 01-13.06.93.

Date	Haul no.	Hour at start	Hour at end	Type of investigations
01.06.93	1	5.30	9.00	Testing codend cover + adjusting handling procedure
	2	9.30	13.30	Selectivity (70 mm, sq. m. window, without chafers)
	3	15.00	18.30	None
	4	19.00	22.30	Selectivity (70 mm, sq. m. window, without chafers)
	5	23.30	3.00	Testing the half circular hoop combined with cover
02.06.93	6	3.30	7.00	Testing the half circular hoop combined with cover
	7	7.30	11.00	Selectivity (70 mm, sq. m. window, without chafers)
	8	11.30	15.00	None
	9	15.30	19.00	Selectivity (70 mm, sq. m. window, without chafers)
	10	19.30	23.00	None
	11	23.30	3.00	None
03.06.93	12	3.30	7.00	Selectivity (70 mm, sq. m. window, without chafers)
	13	7.30	11.00	Selectivity (70 mm, sq. m. window, without chafers)
	14	11.30	15.00	None
	15	15.30	19.00	Selectivity (70 mm, sq. m. window, without chafers)

Table 4.1.1. - Summary of hauls made during Sampling Campaign 01-13.06.93 (continued).

Date	Haul no.	Hour at start	Hour at end	Type of investigations
03.06.93	16	19.30	23.00	None
	17	23.30	3.00	None
04.06.93	18	3.30	7.00	Selectivity (70 mm, sq. m. window, without chafers)
	19	7.30	11.00	Selectivity (70 mm, sq. m. window, without chafers)
	20	11.30	15.00	Selectivity (70 mm, sq. m. window, without chafers)
	21	16.30	20.00	Selectivity (70 mm, sq. m. window, without chafers)
	22	21.30	1.00	None
05.06.93	23	3.00	6.30	Selectivity (70 mm, without chafers)
	24	7.00	10.30	Selectivity (70 mm, without chafers)
	25	11.00	14.30	Selectivity (70 mm, without chafers)
	26	15.00	18.30	None
	27	19.00	22.30	None
	28	23.00	2.30	None
06.06.93	29	4.00	7.30	Selectivity (70 mm, without chafers)
	30	8.00	11.30	None

Table 4.1.1. - Summary of hauls made during Sampling Campaign 01-13.06.93 (continued).

Date	Haul no.	Hour at start	Hour at end	Type of investigations
06.06.93	31	12.30	16.00	Selectivity (70 mm, without chafers)
	32	16.30	20.00	Selectivity (70 mm, without chafers)
	33	20.30	24.00	None
07.06.93	34	0.30	4.00	None
	35	4.30	8.00	None
	36	8.30	12.00	None (trawl out of order)
	37	13.30	15.00	Scanmar measurements
	38	16.00	19.30	None
	39	20.00	23.30	Selectivity (90 mm, without chafers)
08.06.93	40	0.00	3.30	None
	41	4.00	7.30	Selectivity (90 mm, without chafers)
	42	8.00	11.30	Selectivity (90 mm, without chafers)
	43	12.00	15.30	Selectivity (90 mm, without chafers)
	44	16.00	19.30	None
	45	20.00	23.30	None

Table 4.1.1. - Summary of hauls made during Sampling Campaign 01-13.06.93 (continued).

Date	Haul no.	Hour at start	Hour at end	Type of investigations
09.06.93	46	0.00	3.30	None (trawl out of order)
	47	4.30	8.00	Selectivity (90 mm, without chafers)
	48	8.30	12.00	None
	49	12.30	16.00	Selectivity (90 mm, without chafers)
	50	16.30	20.00	Selectivity (90 mm, without chafers)
	51	20.30	24.00	Selectivity (90 mm, without chafers)
10.06.93	52	0.30	4.00	Selectivity (90 mm, without chafers)
	53	5.30	9.00	None
	54	9.30	13.00	None
	55	13.30	17.00	None
	56	17.30	21.00	None
	57	21.30	1.00	None
11.06.93	58	1.30	5.00	None
	59	6.30	10.00	None
	60	10.30	14.00	None

Table 4.1.1. - Summary of hauls made during Sampling Campaign 01-13.06.93 (continued).

Date	Haul no.	Hour at start	Hour at end	Type of investigations
11.06.93	61	14.30	18.00	None
	62	18.30	22.00	None

Table 4.1.2. - Meteorological conditions during Sampling Campaign 01-13.06.93.
Partim : Hauls made for selectivity studies.

Date	Haul no.	Area fished	Wind Direction	Wind Force	Sea state	Cloudiness and rainfall (*)
02.06.93	2	Silver Pit - NE part	E	3-4	Moderate	Sunny
02.06.93	4	Silver Pit - NE part	E	4	Moderate	Overcast
03.06.93	7	Silver Pit	NNE	3	Slight	Sunny
03.06.93	9	Silver Pit	N	2	Smooth	Sunny
04.06.93	12	Silver Pit	ENE	1	Calm	NA (night haul)
04.06.93	13	Silver Pit	Variable	0-1	Calm	Sunny
04.06.93	15	Silver Pit - NW part	SE	1	Calm	Sunny + Misty
05.06.93	18	Silver Pit - NW part	N	2	Smooth	NA (night haul)
05.06.93	19	Silver Pit - NW part	N	2	Smooth	Sunny
05.06.93	20	Silver Pit - NW part	-	0	Calm	Sunny
05.06.93	21	Silver Pit - NW part	-	0	Calm	Sunny
06.06.93	23	Silver Pit - NW part	SW	2	Smooth	NA (night haul)
06.06.93	24	Silver Pit - NW part	SW	2	Slight	Sunny
06.06.93	25	Silver Pit - NW part	SW	2	Slight	Overcast

(*) NA : Not available.

Table 4.1.2. - Meteorological conditions during Sampling Campaign 01-13.06.93 (continued).
 Partim : Hauls made for selectivity studies (continued).

Date	Haul no.	Area fished	Wind Direction	Wind Force	Sea state	Cloudiness and rainfall (*)
07.06.93	29	Silver Pit - NE part	SW	1	Calm	Misty
07.06.93	31	Silver Pit - NE part	-	0	Calm	Sunny
07.06.93	32	Silver Pit - NE part	SSW	1	Calm	Sunny
08.06.93	37	Silver Pit	E	2	Smooth	Sunny
08.06.93	39	Silver Pit - trench	ESE	2	Smooth	Sunny
09.06.93	41	Silver Pit - trench	ESE	2-4	Smooth	Sunny
09.06.93	42	Silver Pit	ESE	2-4	slight	Sunny + Misty
09.06.93	43	Silver Pit	ESE	2-4	slight	Sunny + Misty
10.06.93	47	Silver Pit	NE	2	Smooth	Overcast + Misty
10.06.93	49	Silver Pit	NE	2	Smooth	Overcast + Misty
10.06.93	50	Silver Pit	NE	2	Smooth	Overcast + Misty
10.06.93	51	Silver Pit	-	0	Calm	Overcast + Misty
11.06.93	52	Silver Pit	-	0	Calm	Overcast + Misty

(*) NA : Not available.

Table 4.1.3. - Technical conditions during Sampling Campaign 01-13.06.93.
Partim : Hauls made for selectivity studies.

Date	Haul no.	Hour at start	Hour at end	Duration of haul	Mesh size cod-end	Mesh size cover	Depth	Warp length
02.06.93	2	9.30	13.30	3.30	70 mm	40 mm	33 fm	100 fm
02.06.93	4	19.00	22.30	3.30	70 mm	40 mm	39 fm	100 fm
03.06.93	7	7.30	11.00	3.30	70 mm	40 mm	37 fm	100 fm
03.06.93	9	15.30	19.00	3.30	70 mm	40 mm	37 fm	100 fm
04.06.93	12	3.30	7.00	3.30	70 mm	40 mm	37 fm	100 fm
04.06.93	13	7.30	11.00	3.30	70 mm	40 mm	39 fm	100 fm
04.06.93	15	15.30	19.00	3.30	70 mm	40 mm	35 fm	100 fm
05.06.93	18	3.30	7.00	3.30	70 mm	40 mm	35 fm	100 fm
05.06.93	19	7.30	11.00	3.30	70 mm	40 mm	35 fm	100 fm
05.06.93	20	11.30	15.00	3.30	70 mm	40 mm	35 fm	100 fm
05.06.93	21	16.30	20.00	3.30	70 mm	40 mm	35 fm	100 fm
06.06.93	23	3.00	6.30	3.30	70 mm	40 mm	35 fm	100 fm
06.06.93	24	7.00	10.30	3.30	70 mm	40 mm	35 fm	100 fm
06.06.93	25	11.00	14.30	3.30	70 mm	40 mm	35 fm	100 fm

Table 4.1.3. - Technical conditions during Sampling Campaign 01-13.06.93 (continued).
 Partim : Hauls made for selectivity studies (continued).

Date	Haul no.	Hour at start	Hour at end	Duration of haul	Mesh size cod-end	Mesh size cover	Depth	Warp length
07.06.93	29	4.00	7.30	3.30	70 mm	40 mm	36 fm	100 fm
07.06.93	31	12.30	16.00	3.30	70 mm	40 mm	36 fm	100 fm
07.06.93	32	16.30	20.00	3.30	70 mm	40 mm	36 fm	100 fm
08.06.93	37	13.30	15.30	2.00	70 mm	40 mm	33 fm	100 fm
08.06.93	39	20.00	23.30	3.30	90 mm	40 mm	32 fm	100 fm
09.06.93	41	4.00	7.30	3.30	90 mm	40 mm	36 fm	100 fm
09.06.93	42	8.00	11.30	3.30	90 mm	40 mm	36 fm	100 fm
09.06.93	43	12.00	15.30	3.30	90 mm	40 mm	36 fm	100 fm
10.06.93	47	4.30	8.00	3.30	90 mm	40 mm	39 fm	100 fm
10.06.93	49	12.30	16.00	3.30	90 mm	40 mm	34 fm	90 fm
10.06.93	50	16.30	20.00	3.30	90 mm	40 mm	34 fm	90 fm
10.06.93	51	20.30	24.00	3.30	90 mm	40 mm	34 fm	90 fm
11.06.93	52	0.30	4.00	3.30	90 mm	40 mm	34 fm	90 fm

Table 4.1.4. - Nos. of *Nephrops* measured during Sampling Campaign 01-13.06.93.
Partim : Hauls made for selectivity studies.

Date	Haul no.	Landings whole		Landings tails		Discards		Cod-end cover	
		SF (*)	No.	SF (*)	No.	SF (*)	No.	SF (*)	No.
02.06.93	2	3:4	390	1:1	414	1:2	241	1:4	641
02.06.93	4	1:2	442	1:3	286	2:4½	215	1:8	416
03.06.93	7	1:1	475	1:1	228	2:7½	48	1:2½	417
03.06.93	9	1:2	403	1:2	272	1:3	405	1:3	438
04.06.93	12	4:6½	398	1:2	280	1:7	218	1:3	309
04.06.93	13	1:1	564	1:1	328	1:4½	105	1:3½	223
04.06.93	15	1:3½	300	1:4	199	1:6	139	1:10	208
05.06.93	18	1:4	156	1:2	119	2:11½	51	1:5	217
05.06.93	19	1:2	282	1:2	186	2:8½	68	1:4	193
05.06.93	20	1:2	193	1:2	102	1:8½	47	1:3½	152
06.06.93	23	1:2	383	1:2	236	1:6½	115	1:5	271
06.06.93	24	1:2	327	1:2	184	1:4½	96	1:3	288
06.06.93	25	1:2	148	1:2	98	1:4	75	1:2½	191
07.06.93	29	1:3	470	1:4	261	1:7	421	1:5	629

(*) SF : Sampled fraction.

Table 4.1.4. - Nos. of *Nephrops* measured during Sampling Campaign 01-13.06.93 (continued).
Partim : Hauls made for discard analysis (continued).

Date	Haul no.	Landings whole		Landings tails		Discards		Cod-end cover	
		SF (*)	No.	SF (*)	No.	SF (*)	No.	SF (*)	No.
07.06.93	31	1:2	292	1:2	140	2:4½	214	1:2	166
07.06.93	32	1:3	340	1:4	238	1:11	198	1:2½	542
08.06.93	39	1:4	162	1:4	102	1:6	102	1:5	152
09.06.93	41	1:6	240	1:4	271	1:8	149	1:3	297
09.06.93	42	1:4	181	1:2	211	1:3	184	1:3½	173
09.06.93	43	1:2	176	1:2	95	1:3½	75	1:3½	135
10.06.93	47	1:4	194	1:4	133	1:3	170	1:7	244
10.06.93	49	1:1	134	1:1	49	1:4	8	1:1	93
10.06.93	50	1:2	191	1:2	113	1:2½	42	1:3	152
10.06.93	51	1:4	152	1:2	151	1:2½	188	1:5	275
11.06.93	52	1:2	154	1:2	90	1:3½	57	1:2½	306
Totals			7147		4786		3631		7067
Raised			16.6		11.2		17.2		28.7

(*) SF : Sampled fraction

Raised : Totals of the numbers measured, raised by the corresponding sampling factors, in thousands.

Table 4.1.5. - Nos. of whiting measured during Sampling Campaign 01-13.06.93.
Partim : Hauls made for selectivity studies.

Date	Haul no.	Landings		Discards		Cod-end cover	
		SF (*)	No.	SF (*)	No.	SF (*)	No.
02.06.93	2	1:1	-	1:2	7	1:1	259
02.06.93	4	1:1	-	1:3	18	1:8	221
03.06.93	7	1:1	-	2:7½	10	1:5	197
03.06.93	9	1:1	9	1:3	39	1:3	320
04.06.93	12	1:1	4	1:3½	12	1:3	221
04.06.93	13	1:1	-	1:4½	11	1:3½	223
04.06.93	15	1:1	-	1:6	12	1:5	210
05.06.93	18	1:1	10	2:11½	11	1:5	306
05.06.93	19	1:1	6	2:8½	28	1:8	169
05.06.93	20	1:1	6	1:8½	14	1:3½	251
05.06.93	21	1:1	4	2:13½	25	1:6	194
06.06.93	23	1:1	-	2:11	27	1:5	217
06.06.93	24	1:1	-	1:4½	28	1:6	161
06.06.93	25	1:1	2	1:4	10	1:5	111

(*) SF : Sampled fraction

Table 4.1.5. - Nos. of whiting measured during Sampling Campaign 01-13.06.93 (continued).
Partim : Hauls made for selectivity studies (continued).

Date	Haul no.	Landings		Discards		Cod-end cover		
		SF (*)	No.	SF (*)	No.	SF (*)	No.	
07.06.93	29	1:1	7	1:7	18	1:4	224	
07.06.93	31	1:1	11	2:4½	64	1:4	121	
07.06.93	32	1:1	12	1:5½	42	1:5	179	
08.06.93	39	1:1	-	1:6	11	1:5	172	
09.06.93	41	1:1	27	1:8	79	1:3	245	
09.06.93	42	1:1	15	1:3	26	1:7	135	
09.06.93	43	1:1	43	1:3½	56	1:3½	236	
10.06.93	47	1:1	-	1:3	16	1:7	152	
10.06.93	49	1:1	17	1:4	35	1:5½	101	
10.06.93	50	1:1	34	1:2½	47	1:3	129	
10.06.93	51	1:1	21	1:2½	76	1:5	199	
11.06.93	52	1:1	-	1:3½	29	1:10	103	
Totals			228		691		5056	
Raised			228		3240		23668	

(*) SF : Sampled fraction

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.2.1. - Summary of hauls made during Sampling Campaign 17-29.06.93.

Date	Haul no.	Hour at start	Hour at end	Type of investigations
18.06.93	1	8.30	12.00	Discards <i>Nephrops</i> and fish
	2	12.30	16.00	None
	3	16.30	20.00	Discards <i>Nephrops</i> and fish
	4	20.30	24.00	None
19.06.93	5	0.30	4.00	Discards <i>Nephrops</i> and fish
	6	4.30	8.00	Discards <i>Nephrops</i> and fish
	7	8.30	12.00	None
	8	12.30	16.00	Discards <i>Nephrops</i> and fish
	9	16.30	20.00	None
	10	20.30	24.00	Discards <i>Nephrops</i> and fish
20.06.93	11	0.30	4.00	None
	12	4.30	8.00	Discards <i>Nephrops</i> and fish
	13	8.30	12.00	Discards <i>Nephrops</i> and fish
	14	12.30	16.00	Discards <i>Nephrops</i> and fish
	15	16.30	20.00	None

Table 4.2.1. - Summary of hauls made during Sampling Campaign 17-29.06.93 (continued).

Date	Haul no.	Hour at start	Hour at end	Type of investigations
20.06.93	16	20.30	24.00	Discards <i>Nephrops</i> and fish
21.06.93	17	0.30	4.00	None
	18	4.30	8.00	Discards <i>Nephrops</i> and fish
	19	8.30	12.00	Discards <i>Nephrops</i> and fish
	20	12.30	16.00	None
	21	16.30	20.00	Discards <i>Nephrops</i> and fish
	22	20.30	24.00	None
22.06.93	23	0.30	4.00	Discards <i>Nephrops</i> and fish
	24	4.30	8.00	None
	****	8.00	9.00	Chafers removed from cod-end, cod-end cover attached
	25	9.00	13.00	Selectivity (70 mm, without chafers)
	26	13.30	17.00	None (trawl out of order)
	27	18.30	22.00	Selectivity (70 mm, without chafers)
	28	22.15	1.45	None
23.06.93	29	2.15	5.45	None (trawl out of order)

Table 4.2.1. - Summary of hauls made during Sampling Campaign 17-29.06.93 (continued).

Date	Haul no.	Hour at start	Hour at end	Type of investigations
23.06.93	****	6.00	7.45	Cod-end shortened
	30	8.00	12.00	Selectivity (70 mm, without chafers)
	31	12.30	16.30	None
	32	17.00	21.00	Selectivity (70 mm, without chafers)
	33	21.30	1.30	None
24.06.93	34	2.00	5.45	None
	35	6.15	10.30	Selectivity (70 mm, without chafers)
	36	11.00	15.00	Selectivity (70 mm, without chafers)
	37	15.30	19.30	Selectivity (70 mm, without chafers)
	38	20.00	24.00	None
25.06.93	39	0.30	4.00	None
	40	4.30	8.00	Selectivity (70 mm, without chafers)
	41	8.30	12.00	Selectivity (70 mm, without chafers)
	42	12.30	16.00	Selectivity (70 mm, without chafers)
	43	16.30	20.00	None (trawl out of order)

Table 4.2.1. - Summary of hauls made during Sampling Campaign 17-29.06.93 (continued).

Date	Haul no.	Hour at start	Hour at end	Type of investigations
25.06.93	44	20.30	24.00	None
26.06.93	****	0.00	1.15	Chafers attached to cod-end
	45	1.30	5.00	Selectivity (70 mm, with chafers) + Discards N/F (*)
	46	5.30	9.00	None
	47	11.00	14.30	Selectivity (70 mm, with chafers) + Discards N/F
	48	15.00	18.30	Selectivity (70 mm, with chafers) + Discards N (*)
	49	19.00	23.00	Selectivity (70 mm, with chafers) + Discards N
	50	23.30	3.30	None
27.06.93	51	4.00	8.00	Selectivity (70 mm, with chafers) + Discards N
	52	8.30	12.00	Selectivity (70 mm, with chafers) + Discards N/F
	53	12.30	16.00	None
	54	16.30	20.00	Selectivity (70 mm, with chafers) + Discards N
	55	20.30	24.00	Selectivity (70 mm, with chafers) + Discards N/F
28.06.93	56	0.30	4.00	None
	57	4.30	8.00	Selectivity (70 mm, with chafers) + Discards N/F

Table 4.2.1. - Summary of hauls made during Sampling Campaign 17-29.06.93 (continued).

Date	Haul no.	Hour at start	Hour at end	Type of investigations
28.06.93	58	8.30	12.00	None
	59	12.30	16.00	None (trawl out of order)
	60	17.00	22.00	Discards fish only

(*) Discards N/F : Discards *Nephrops* and fish (whiting, cod, gurnards, dab, plaice and sole).
 Discards N : Discards *Nephrops* only.

Table 4.2.2. - Meteorological conditions during Sampling Campaign 17-29.06.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Area fished	Wind Direction	Wind Force	Sea state	Cloudiness and rainfall (*)
18.06.93	1	Silver Pit - NW part	SSW	4	Moderate	Overcast + Misty
18.06.93	3	Silver Pit - NW part	SSW	4	Moderate	Sunny
19.06.93	5	Silver Pit - NW part	WSW	2	Slight	NA (night haul)
19.06.93	6	Silver Pit - NW part	WSW	2	Slight	NA (night haul)
19.06.93	8	Silver Pit - NW part	WSW	4	Moderate	Sunny
19.06.93	10	Silver Pit - NW part	WSW	4	Moderate	NA (night haul)
20.06.93	12	Silver Pit - NW part	W	4	Moderate	Sunny
20.06.93	13	Silver Pit	NW	4	Moderate	Sunny
20.06.93	14	Silver Pit	NW	1	Slight	Sunny
20.06.93	16	Botney Gut	Variable	0-1	Slight	Sunny
21.06.93	18	Silver Pit - NE part	WSW	2	Slight	Sunny
21.06.93	19	Silver Pit	W	1	Slight	Sunny
21.06.93	21	Silver Pit	NW	2	Slight	Overcast
22.06.93	23	Silver Pit	WSW	2	Slight	NA (night haul)

(*) NA : Not available.

Table 4.2.2. - Meteorological conditions during Sampling Campaign 17-29.06.93 (continued).
Partim : Hauls made for discard analysis (continued).

Date	Haul no.	Area fished	Wind Direction	Wind Force	Sea state	Cloudiness and rainfall (*)
26.06.93	45	Silver Pit - trench	SW	2-4	Slight	Overcast + Rain
26.06.93	47	Silver Pit - NE part	SSW	4	Moderate	Overcast + Rain
26.06.93	48	Silver Pit - NE part	SW	3	Moderate	Overcast
26.06.93	49	Silver Pit - NE part	SW	2	Slight	Overcast
27.06.93	51	Silver Pit	NW	2	Slight	Overcast
27.06.93	52	Silver Pit	NW	2-4	Slight	Overcast
27.06.93	54	Silver Pit	WNW	4	Moderate	Sunny
27.06.93	55	Silver Pit	NW	2	Moderate	NA (night haul)
28.06.93	57	Silver Pit	N	4	Moderate	Overcast
28.06.93	60	Silver Pit	Variable	0-1	Smooth	Overcast

(*) NA : Not available.

Table 4.2.2. - Meteorological conditions during Sampling Campaign 17-29.06.93 (continued).
 Partim : Hauls made for selectivity studies (70 mm cod-end, without chafers).

Date	Haul no.	Area fished	Wind Direction	Wind Force	Sea state	Cloudiness and rainfall (*)
22.06.93	25	Silver Pit	SW	2	Slight	Overcast + Rain
22.06.93	27	Silver Pit - NW part	N	3	Moderate	Overcast
23.06.93	30	Silver Pit	NNW	4	Moderate	Overcast + Rain
23.06.93	32	Silver Pit	NNW	5	Moderate	Overcast
24.06.93	35	Silver Pit - NE part	NNW	5	Rough	Overcast
24.06.93	36	Silver Pit - NE part	NNW	5	Rough	Overcast
24.06.93	37	Silver Pit - NE part	NNW	4	Rough	Overcast
25.06.93	40	Silver Pit	NNW	2	Moderate	Sunny
25.06.93	41	Silver Pit	NNW	2	Moderate	Sunny
25.06.93	42	Silver Pit	NNW	2	Slight	Sunny

(*) NA : Not available.

Table 4.2.2. - Meteorological conditions during Sampling Campaign 17-29.06.93 (continued).
Partim : Hauls made for selectivity studies (70 mm cod-end, with chafers).

Date	Haul no.	Area fished	Wind Direction	Wind Force	Sea state	Cloudiness and rainfall (*)
26.06.93	45	Silver Pit - trench	SW	2-4	Slight	Overcast + Rain
26.06.93	47	Silver Pit - NE part	SSW	4	Moderate	Overcast + Rain
26.06.93	48	Silver Pit - NE part	SW	3	Moderate	Overcast
26.06.93	49	Silver Pit - NE part	SW	2	Slight	Overcast
27.06.93	51	Silver Pit	NW	2	Slight	Overcast
27.06.93	52	Silver Pit	NW	2-4	Slight	Overcast
27.06.93	54	Silver Pit	WNW	4	Moderate	Sunny
27.06.93	55	Silver Pit	NW	2	Moderate	NA (night haul)
28.06.93	57	Silver Pit	N	4	Moderate	Overcast

(*) NA : Not available.

Table 4.2.3. - Technical conditions during Sampling Campaign 17-29.06.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Hour at start	Hour at end	Duration of haul	Mesh size cod-end	Mesh-size cover	Depth	Warp length
18.06.93	1	8.30	12.00	3.30	70 mm	None	37 fm	100 fm
18.06.93	3	16.30	20.00	3.30	70 mm	None	35 fm	100 fm
19.06.93	5	0.30	4.00	3.30	70 mm	None	35 fm	100 fm
19.06.93	6	4.30	8.00	3.30	70 mm	None	35 fm	100 fm
19.06.93	8	12.30	16.00	3.30	70 mm	None	35 fm	100 fm
19.06.93	10	20.30	24.00	3.30	70 mm	None	35 fm	100 fm
20.06.93	12	4.30	8.00	3.30	70 mm	None	38 fm	100 fm
20.06.93	13	8.30	12.00	3.30	70 mm	None	37 fm	100 fm
20.06.93	14	12.30	16.00	3.30	70 mm	None	36 fm	100 fm
20.06.93	16	20.30	24.00	3.30	70 mm	None	34 fm	80 fm
21.06.93	18	4.30	8.00	3.30	70 mm	None	32 fm	90 fm
21.06.93	19	8.30	12.00	3.30	70 mm	None	35 fm	100 fm
21.06.93	21	16.30	20.00	3.30	70 mm	None	30 fm	90 fm
22.06.93	23	0.30	4.00	3.30	70 mm	None	36 fm	100 fm

Table 4.2.3. - Technical conditions during Sampling Campaign 17-29.06.93 (continued).
 Partim : Hauls made for discard analysis (continued).

Date	Haul no.	Hour at start	Hour at end	Duration of haul	Mesh size cod-end	Mesh-size cover	Depth	Warp length
26.06.93	45	1.30	5.00	3.30	70 mm	40 mm	32 fm	90 fm
26.06.93	47	11.00	14.30	3.30	70 mm	40 mm	32 fm	90 fm
26.06.93	48	15.00	18.30	3.30	70 mm	40 mm	32 fm	90 fm
26.06.93	49	19.00	23.00	4.00	70 mm	40 mm	32 fm	90 fm
27.06.93	51	4.00	8.00	4.00	70 mm	40 mm	33 fm	90 fm
27.06.93	52	8.30	12.00	3.30	70 mm	40 mm	32 fm	90 fm
27.06.93	54	16.30	20.00	3.30	70 mm	40 mm	35 fm	100 fm
27.06.93	55	20.30	24.00	3.30	70 mm	40 mm	38 fm	100 fm
28.06.93	57	4.30	8.00	3.30	70 mm	40 mm	38 fm	100 fm
28.06.93	60	17.00	22.00	5.00	70 mm	40 mm	38 fm	100 fm

Table 4.2.3. - Technical conditions during Sampling Campaign 17-29.06.93 (continued).
 Partim : Hauls made for selectivity studies (70 mm cod-end, without chafers).

Date	Haul no.	Hour at start	Hour at end	Duration of haul	Mesh size cod-end	Mesh-size cover	Depth	Warp length
22.06.93	25	9.00	13.00	4.00	70 mm	40 mm	38 fm	100 fm
22.06.93	27	18.30	22.00	3.30	70 mm	40 mm	38 fm	100 fm
23.06.93	30	8.00	12.00	4.00	70 mm	40 mm	36 fm	100 fm
23.06.93	32	17.00	21.00	4.00	70 mm	40 mm	32 fm	90 fm
24.06.93	35	6.15	10.30	4.15	70 mm	40 mm	32 fm	90 fm
24.06.93	36	11.00	15.00	4.00	70 mm	40 mm	32 fm	90 fm
24.06.93	37	15.30	19.30	4.00	70 mm	40 mm	32 fm	90 fm
25.06.93	40	4.30	8.00	3.30	70 mm	40 mm	32 fm	90 fm
25.06.93	41	8.30	12.00	3.30	70 mm	40 mm	36 fm	100 fm
25.06.93	42	12.30	16.00	3.30	70 mm	40 mm	32 fm	90 fm

Table 4.2.3. - Technical conditions during Sampling Campaign 17-29.06.93 (continued).
 Partim : Hauls made for selectivity studies (70 mm cod-end, with chafers).

Date	Haul no.	Hour at start	Hour at end	Duration of haul	Mesh size cod-end	Mesh-size cover	Depth	Warp length
26.06.93	45	1.30	5.00	3.30	70 mm	40 mm	32 fm	90 fm
26.06.93	47	11.00	14.30	3.30	70 mm	40 mm	32 fm	90 fm
26.06.93	48	15.00	18.30	3.30	70 mm	40 mm	32 fm	90 fm
26.06.93	49	19.00	23.00	4.00	70 mm	40 mm	32 fm	90 fm
27.06.93	51	4.00	8.00	4.00	70 mm	40 mm	33 fm	90 fm
27.06.93	52	8.30	12.00	3.30	70 mm	40 mm	32 fm	90 fm
27.06.93	54	16.30	20.00	3.30	70 mm	40 mm	35 fm	100 fm
27.06.93	55	20.30	24.00	3.30	70 mm	40 mm	38 fm	100 fm
28.06.93	57	4.30	8.00	3.30	70 mm	40 mm	38 fm	100 fm

Table 4.2.4. - Nos. of *Nephrops* measured during Sampling Campaign 17-29.06.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Landings whole		Landings tails		Discards		Cod-end cover	
		SF (*)	No.	SF (*)	No.	SF (*)	No.	SF (*)	No.
18.06.93	1	1:1	71	1:1	33	4:10½	8		
18.06.93	3	1:1	361	1:1	105	2:4½	16		
19.06.93	5	1:2	247	1:2	178	1:4	68		
19.06.93	6	1:2	342	1:2	344	2:5½	158		
19.06.93	8	1:1	135	1:1	38	2:11½	9		
19.06.93	10	1:2	212	1:2	226	4:11½	101		
20.06.93	12	1:3	326	1:4	229	1:5½	191		
20.06.93	13	1:1	360	1:1	209	1:1	117		
20.06.93	14	1:1	279	1:2	146	1:1	194		
20.06.93	16	1:1	191	1:1	167	4:5½	123		
21.06.93	18	1:3	333	1:5	210	1:7	210		
21.06.93	19	1:2	312	1:3	199	1:2½	251		
21.06.93	21	1:2	364	1:5	185	1:4	163		
22.06.93	23	1:1	232	1:1	97	4:5½	68		

(*) SF : Sampled fraction.

Table 4.2.4. - Nos. of *Nephrops* measured during Sampling Campaign 17-29.06.93 (continued).
Partim : Hauls made for discard analysis (continued).

Date	Haul no.	Landings whole		Landings tails		Discards		Cod-end cover	
		SF (*)	No.	SF (*)	No.	SF (*)	No.	SF (*)	No.
26.06.93	45	1:1	239	1:1	105	1:2	41		
26.06.93	47	1:1	39	1:1	27	1:2	23		
26.06.93	48	1:1	88	1:1	12	1:1½	17		
26.06.93	49	1:2	182	1:1	245	4:5½	166		
27.06.93	51	1:2	231	1:2	188	2:2½	124		
27.06.93	52	1:1	145	1:1	55	4:4½	38		
27.06.93	54	1:1	242	1:1	93	1:1½	35		
27.06.93	55	1:2	278	1:2	173	2:2½	84		
28.06.93	57	1:2	218	1:1	243	1:2	61		
Totals			5427		3507		2266		
Raised			9.1		7.4		6.3		

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors, in thousands.

Table 4.2.4. - Nos. of *Nephrops* measured during Sampling Campaign 17-29.06.93 (continued).
Partim : Hauls made for selectivity studies (70 mm cod-end, without chafers).

Date	Haul no.	Landings whole		Landings tails		Discards		Cod-end cover	
		SF (*)	No.	SF (*)	No.	SF (*)	No.	SF (*)	No.
22.06.93	25	1:1	237	1:1	163	1:1½	70	1:2	277
22.06.93	27	1:4	192	1:5	123	1:3	99	1:2½	304
23.06.93	30	1:1	263	1:1	121	1:1½	38	1:3	129
23.06.93	32	1:1	193	1:1	34	2:2½	14	1:1	90
24.06.93	35	1:2	238	1:2	175	1:1½	134	1:2	680
24.06.93	36	1:1	149	1:1	51	2:2½	29	2:3½	315
24.06.93	37	1:2	201	1:1	168	3½:5½	131	1:4½	239
25.06.93	40	1:1	318	1:1	217	4:6½	167	1:2½	269
25.06.93	41	1:1	158	1:1	75	1:1	63	1:1	241
25.06.93	42	1:2	232	1:2	253	1:1½	167	1:3	309
Totals			2181		1380		912		2853
Raised			3.4		2.3		1.5		6.6

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors, in thousands.

Table 4.2.4. - Nos. of *Nephrops* measured during Sampling Campaign 17-29.06.93 (continued).
 Partim : Hauls made for selectivity studies (70 mm cod-end, with chafers).

Date	Haul no.	Landings whole		Landings tails		Discards		Cod-end cover	
		SF (*)	No.	SF (*)	No.	SF (*)	No.	SF (*)	No.
26.06.93	45	1:1	239	1:1	105	1:2	41	1:1	216
26.06.93	47	1:1	39	1:1	27	1:2	23	1:1	138
26.06.93	48	1:1	88	1:1	12	1:1½	17	1:1	251
26.06.93	49	1:2	182	1:1	245	4:5½	166	1½:2½	452
27.06.93	51	1:2	231	1:2	188	2:2½	124	2:4½	441
27.06.93	52	1:1	145	1:1	55	4:4½	38	1:1	78
27.06.93	54	1:1	242	1:1	93	1:1½	35	1:2	76
27.06.93	55	1:2	278	1:2	173	2:2½	84	2:8½	226
28.06.93	57	1:2	218	1:1	243	1:2	61	1:6	218
Totals			1662		1141		589		2096
Raised			2.6		1.5		0.9		4.8

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors, in thousands.

Table 4.2.5. - Nos. of whiting measured during Sampling Campaign 17-29.06.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Landings		Discards		Cod-end cover	
		SF (*)	No.	SF (*)	No.	SF (*)	No.
18.06.93	1	1:1	39	4:10½	15		
18.06.93	3	1:1	26	2:4½	23		
19.06.93	5	1:1	26	1:4	17		
19.06.93	6	1:1	26	2:5½	17		
19.06.93	8	1:1	66	2:11½	22		
19.06.93	10	1:1	37	4:11½	18		
20.06.93	12	1:1	48	2:5½	24		
20.06.93	13	1:1	25	1:1	24		
20.06.93	14	1:1	13	1:1	74		
20.06.93	16	1:1	58	4:5½	220		
21.06.93	18	1:1	18	2:3½	32		
21.06.93	19	1:1	31	2:2½	41		
21.06.93	21	1:1	38	1:1	134		
22.06.93	23	1:1	61	4:5½	28		

(*) SF : Sampled fraction.

Table 4.2.5. - Nos. of whiting measured during Sampling Campaign 17-29.06.93 (continued).
Partim : Hauls made for discard analysis (continued).

Date	Haul no.	Landings		Discards		Cod-end cover	
		SF (*)	No.	SF (*)	No.	SF (*)	No.
26.06.93	45	1:1	156	1:2	234		
26.06.93	47	1:1	35	1:2	99		
26.06.93	48	1:1	41	1:1½	122		
26.06.93	49	1:1	50	4:5½	134		
27.06.93	51	1:1	222	1:2½	146		
27.06.93	52	1:1	103	2:4½	126		
27.06.93	54	1:1	82	1:1½	82		
27.06.93	55	1:1	76	1:2½	106		
28.06.93	57	1:1	64	1:2	98		
28.06.93	60	1:1	154	2:5½	176		
Totals			1495		2012		
Raised			1495		3880		

(*) SF : Sampled fraction

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.2.5. - Nos. of whiting measured during Sampling Campaign 17-29.06.93 (continued).
 Partim : Hauls made for selectivity studies (70 mm cod-end, without chafers).

Date	Haul no.	Landings		Discards		Cod-end cover		
		SF (*)	No.	SF (*)	No.	SF (*)	No.	
22.06.93	25	1:1	20	1:1½	26	1:4	419	
22.06.93	27	1:1	41	1:3	82	1:5	398	
23.06.93	30	1:1	71	1:1½	100	1:6	375	
23.06.93	32	1:1	75	2:2½	109	1:6	282	
24.06.93	35	1:1	66	1:1½	79	1:4	206	
24.06.93	36	1:1	34	2:2½	44	2:3½	315	
24.06.93	37	1:1	45	3½:5½	102	1:4½	218	
25.06.93	40	1:1	70	4:6½	109	1:2½	208	
25.06.93	41	1:1	107	1:1	195	1:2½	425	
25.06.93	42	1:1	19	1:1½	102	1:3	182	
Totals			548		948		3028	
Raised			548		1430		12093	

(*) SF : Sampled fraction

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.2.5. - Nos. of whiting measured during Sampling Campaign 17-29.06.93 (continued).
Partim : Hauls made for selectivity studies (70 mm cod-end, with chafers).

Date	Haul no.	Landings		Discards		Cod-end cover	
		SF (*)	No.	SF (*)	No.	SF (*)	No.
26.06.93	45	1:1	156	1:2	234	1:4	371
26.06.93	47	1:1	35	1:2	99	1:3½	232
26.06.93	48	1:1	41	1:1½	122	1:5	263
26.06.93	49	1:1	50	4:5½	134	1:2½	211
27.06.93	51	1:1	222	1:2½	146	1:4½	375
27.06.93	52	1:1	103	2:4½	126	1:2	292
27.06.93	54	1:1	82	1:1½	82	1:8	435
27.06.93	55	1:1	76	1:2½	106	1:8½	382
28.06.93	57	1:1	64	1:2	98	1:6	570
Totals			829		1147		3131
Raised			829		2266		16557

(*) SF : Sampled fraction

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.2.6. - Nos. of cod measured during Sampling Campaign 17-29.06.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Landings		Discards	
		SF (*)	No.	SF (*)	No.
18.06.93	1	1:1	17	4:10½	1
18.06.93	3	1:1	4	2:4½	1
19.06.93	5	1:1	9	1:4	1
19.06.93	6	1:1	5	2:5½	1
19.06.93	8	1:1	13	2:11½	2
19.06.93	10	1:1	1	4:11½	2
20.06.93	12	1:1	8	2:5½	-
20.06.93	13	1:1	7	1:1	5
20.06.93	14	1:1	23	1:1	1
20.06.93	16	1:1	2	4:5½	-
21.06.93	18	1:1	14	2:3½	-
21.06.93	19	1:1	15	1:1	1
21.06.93	21	1:1	18	1:1	1
22.06.93	23	1:1	8	4:5½	5
26.06.93	45	1:1	27	1:2	2
26.06.93	47	1:1	19	1:2	-
27.06.93	52	1:1	9	4:4½	2
27.06.93	55	1:1	26	2:2½	12
28.06.93	57	1:1	21	1:2	3
28.06.93	60	1:1	21	2:5½	2
Totals			267		42
Raised			267		76

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.2.7. - Nos. of gurnards measured during Sampling Campaign 17-29.06.93. Partim : Hauls made for discard analysis.					
Date	Haul no.	Landings		Discards	
		SF (*)	No.	SF (*)	No.
18.06.93	1	1:1	11	4:10½	30
18.06.93	3	1:1	11	2:4½	15
19.06.93	5	1:1	2	1:4	-
19.06.93	6	1:1	1	2:5½	14
19.06.93	8	1:1	2	2:11½	3
19.06.93	10	1:1	4	4:11½	12
20.06.93	12	1:1	4	2:5½	22
20.06.93	13	1:1	4	1:1	76
20.06.93	14	1:1	1	1:1	13
20.06.93	16	1:1	-	4:5½	1
21.06.93	18	1:1	10	2:3½	9
21.06.93	19	1:1	3	2:2½	12
21.06.93	21	1:1	2	1:1	6
22.06.93	23	1:1	9	4:5½	19
26.06.93	45	1:1	9	1:2	30
26.06.93	47	1:1	4	1:2	35
27.06.93	52	1:1	2	4:4½	15
27.06.93	55	1:1	3	2:2½	53
28.06.93	57	1:1	4	1:2	42
28.06.93	60	1:1	3	2:5½	48
Totals			89		455
Raised			89		846

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.2.8. - Nos. of dab measured during Sampling Campaign 17-29.06.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Landings		Discards	
		SF (*)	No.	SF (*)	No.
18.06.93	1	1:1	3	2:10½	214
18.06.93	3	1:1	6	1:18	245
19.06.93	5	1:1	9	1:32	178
19.06.93	6	1:1	10	1:22	202
19.06.93	8	1:1	13	1:46	195
19.06.93	10	1:1	4	1:23	172
20.06.93	12	1:1	4	1:11	168
20.06.93	13	1:1	7	1:3½	156
20.06.93	14	1:1	3	1:3	70
20.06.93	16	1:1	1	2:5½	126
21.06.93	18	1:1	1	1:7	107
21.06.93	19	1:1	3	1:5	104
21.06.93	21	1:1	7	1:4	137
22.06.93	23	1:1	3	1:5½	186
26.06.93	45	1:1	3	1:8	143
26.06.93	47	1:1	2	1:6	129
27.06.93	52	1:1	3	1:4½	140
27.06.93	55	1:1	8	1:5	248
28.06.93	57	1:1	2	1:6	117
28.06.93	60	1:1	11	1:11	198
Totals			103		3235
Raised			103		41058

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.2.9. - Nos. of plaice measured during Sampling Campaign 17-29.06.93. Partim : Hauls made for discard analysis.					
Date	Haul no.	Landings		Discards	
		SF (*)	No.	SF (*)	No.
18.06.93	1	1:1	65	4:10½	-
18.06.93	3	1:1	76	2:4½	4
19.06.93	5	1:1	68	1:4	7
19.06.93	6	1:1	46	2:5½	-
19.06.93	8	1:1	205	2:11½	5
19.06.93	10	1:1	37	4:11½	1
20.06.93	12	1:1	22	2:5½	-
20.06.93	13	1:1	17	1:1	1
20.06.93	14	1:1	31	1:1	4
20.06.93	16	1:1	18	4:5½	10
21.06.93	18	1:1	82	2:3½	3
21.06.93	19	1:1	52	2:2½	6
21.06.93	21	1:1	16	1:1	4
22.06.93	23	1:1	15	4:5½	2
26.06.93	45	1:1	37	1:2	1
26.06.93	47	1:1	101	1:2	15
27.06.93	52	1:1	43	4:4½	-
27.06.93	55	1:1	27	2:2½	1
28.06.93	57	1:1	71	1:1	6
28.06.93	60	1:1	52	2:5½	2
Totals			1081		72
Raised			1081		152

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.2.10. - Nos. of sole measured during Sampling Campaign 17-29.06.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Landings		Discards	
		SF (*)	No.	SF (*)	No.
18.06.93	1	1:1	3	4:10½	-
18.06.93	3	1:1	3	2:4½	1
19.06.93	5	1:1	6	1:1	10
19.06.93	6	1:1	5	1:1	12
19.06.93	8	1:1	5	2:11½	2
19.06.93	10	1:1	2	1:1	3
20.06.93	12	1:1	5	1:1	8
20.06.93	13	1:1	5	1:1	-
20.06.93	14	1:1	5	1:1	-
20.06.93	16	1:1	4	4:5½	1
21.06.93	18	1:1	19	1:1	3
21.06.93	19	1:1	12	1:1	1
21.06.93	21	1:1	7	1:1	2
22.06.93	23	1:1	13	4:5½	-
26.06.93	45	1:1	4	1:2	-
26.06.93	47	1:1	9	1:2	-
27.06.93	52	1:1	4	4:4½	-
27.06.93	55	1:1	6	2:2½	-
28.06.93	57	1:1	8	1:2	-
28.06.93	60	1:1	3	2:5½	-
Totals			128		43
Raised			128		54

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.2.11. - Sampling Campaign 17-29.06.93 : Data sets of 6 hauls each, covering a period of 24 hours.

Data set	Species	Hauls
1	Nephrops and fish	3 + 5 + 6 + 8 + 10 + 13
2	Nephrops and fish	14 + 16 + 18 + 19 + 21 + 23
3	Nephrops	45 + (47+48)/2 + 52 + 54 + 55 + 57
	Fish	45 + 47 + 52 + 55 + 57 + 60

Table 4.3.1. - Summary of hauls made during Sampling Campaign 28.08-09.09.93

Date	Haul no.	Hour at start	Hour at end	Type of investigations
01.09.93	21	14.15	17.45	Discards <i>Nephrops</i> and fish
	22	18.15	22.00	None
	23	22.30	2.00	Discards <i>Nephrops</i> and fish
02.09.93	24	2.30	6.00	None
	25	6.30	10.00	Discards <i>Nephrops</i> and fish
	26	10.30	14.00	Discards <i>Nephrops</i> and fish
	27	14.30	18.00	None
	28	18.30	22.00	Discards <i>Nephrops</i> and fish
	29	22.30	2.00	None
03.09.93	30	2.30	6.00	Discards <i>Nephrops</i> and fish
	31	7.00	10.30	Discards <i>Nephrops</i> and fish
	32	11.00	14.30	None
	33	15.00	18.30	Discards <i>Nephrops</i> and fish
	34	19.00	22.30	None
	35	23.00	2.30	Discards <i>Nephrops</i> and fish + Survival exp. 1

Table 4.3.1. - Summary of hauls made during Sampling Campaign 28.08-09.09.93 (continued).

Date	Haul no.	Hour at start	Hour at end	Type of investigations
04.09.93	36	3.00	6.30	Discards <i>Nephrops</i> and fish + Survival exp. 2
	37	7.00	10.30	None
	38	11.00	14.30	Discards <i>Nephrops</i> and fish
	39	15.00	18.30	None
	40	19.00	22.30	Discards <i>Nephrops</i> and fish
	41	23.00	2.30	None
05.09.93	42	3.00	6.30	None
	43	7.00	10.30	None
	44	11.00	14.30	Discards <i>Nephrops</i> and fish + Survival exp. 3
	45	15.00	18.30	None
	46	19.00	22.30	Discards <i>Nephrops</i> and fish + Survival exp. 4
	47	23.00	2.30	None
06.09.93	48	3.00	6.30	Discards <i>Nephrops</i> and fish + Survival exp. 5
	49	7.00	10.30	Discards <i>Nephrops</i> and fish + Survival exp. 6 and 7
	50	11.00	14.30	None

Table 4.3.1. - Summary of hauls made during Sampling Campaign 28.08-09.09.93 (continued).

Date	Haul no.	Hour at start	Hour at end	Type of investigations
06.09.93	51	15.00	18.30	Discards <i>Nephrops</i> and fish + Survival exp. 8 and 9
	52	19.00	22.45	None
	53	23.15	3.00	Discards <i>Nephrops</i> and fish + Survival exp. 10
07.09.93	54	3.30	7.30	None
	55	8.00	11.30	None
	****	11.45	12.45	Engine break-down
	56	13.00	17.00	Sexual maturity female <i>Nephrops</i>
	57	17.30	21.00	None
	58	21.30	0.30	None
08.09.93	59	1.00	5.00	None
	60	5.30	9.00	Sexual maturity female <i>Nephrops</i>
	61	9.30	13.00	None
	62	13.30	17.00	None

Table 4.3.2. - Meteorological conditions during Sampling Campaign 28.08-09.09.93
Partim : Hauls made for discard analysis.

Date	Haul no.	Area fished	Wind Direction	Wind Force	Sea state	Cloudiness and rainfall (*)
01.09.93	21	Silver Pit - NW part	NNW	3	Slight	Overcast
01.09.93	23	Silver Pit - NW part	SW	2	Slight	NA (night haul)
02.09.93	25	Silver Pit - NE part	WSW	2	Slight	Overcast
02.09.93	26	Silver Pit - NE part	N	4	Moderate	Overcast
02.09.93	28	Silver Pit - NE part	N	3-5	Moderate	Overcast
03.09.93	30	Silver Pit - NE part	NNW	4-6	Moderate	NA (night haul)
03.09.93	31	Silver Pit - NE part	NNW	6	Rough	Overcast
03.09.93	33	Silver Pit and Botney	N	6	Rough	Overcast
03.09.93	35	Silver Pit - NE part	N	6	Rough	NA (night haul)
04.09.93	36	Silver Pit - NE part	N	6	Rough	NA (night haul)
04.09.93	38	Silver Pit - NE part	N	6	Rough	Overcast
04.09.93	40	Silver Pit - NE part	N	4-6	Rough	Overcast
05.09.93	44	Silver Pit	NNW	2	Moderate	Overcast
05.09.93	46	Silver Pit	NW	2	Moderate	Overcast

(*) NA : Not available.

Table 4.3.2. - Meteorological conditions during Sampling Campaign 28.08-09.09.93 (continued)
Partim : Hauls made for discard analysis (continued).

Date	Haul no.	Area fished	Wind Direction	Wind Force	Sea state	Cloudiness and rainfall (*)
06.09.93	48	Silver Pit - trench	W	1	Slight	NA (night haul)
06.09.93	49	Silver Pit - trench	NW	2	Slight	Overcast
06.09.93	51	Silver Pit - trench	NW	2	Slight	Overcast
06.09.93	53	Silver Pit - trench	N	2	Slight	NA (night haul)

(*) NA : Not available.

Table 4.3.2. - Meteorological conditions during Sampling Campaign 28.08-09.09.93 (continued)
Partim : Hauls made for the analysis of Nephrops sexual maturity.

Date	Haul no.	Area fished	Wind Direction	Wind Force	Sea state	Cloudiness and rainfall (*)
07.09.93	56	Silver Pit	E	3	Slight	Overcast
08.09.93	60	Silver Pit - trench	ESE	6	Rough	Overcast

Table 4.3.3. - Technical conditions during Sampling Campaign 28.08-09.09.93
Partim : Hauls made for discard analysis.

Date	Haul no.	Hour at start	Hour at end	Duration of haul	Mesh size cod-end	Mesh-size cover	Depth	Warp length
01.09.93	21	14.15	17.45	3.30	70 mm	None	36 fm	110 fm
01.09.93	23	22.30	2.00	3.30	70 mm	None	36 fm	110 fm
02.09.93	25	6.30	10.00	3.30	70 mm	None	33 fm	100 fm
02.09.93	26	10.30	14.00	3.30	70 mm	None	33 fm	110 fm
02.09.93	28	18.30	22.00	3.30	70 mm	None	32 fm	100 fm
03.09.93	30	2.30	6.00	3.30	70 mm	None	32 fm	100 fm
03.09.93	31	7.00	10.30	3.30	70 mm	None	32 fm	100 fm
03.09.93	33	15.00	18.30	3.30	70 mm	None	33 fm	100 fm
03.09.93	35	23.00	2.30	3.30	70 mm	None	32 fm	100 fm
04.09.93	36	3.00	6.30	3.30	70 mm	None	32 fm	100 fm
04.09.93	38	11.00	14.30	3.30	70 mm	None	32 fm	100 fm
04.09.93	40	19.00	22.30	3.30	70 mm	None	32 fm	100 fm
05.09.93	44	11.00	14.30	3.30	70 mm	None	36 fm	110 fm
05.09.93	46	19.00	22.30	3.30	70 mm	None	35 fm	110 fm

Table 4.3.3. - Technical conditions during Sampling Campaign 28.08-09.09.93 (continued).
Partim : Hauls made for discard analysis (continued).

Date	Haul no.	Hour at start	Hour at end	Duration of haul	Mesh size cod-end	Mesh-size cover	Depth	Warp length
06.09.93	48	3.00	6.30	3.30	70 mm	None	32 fm	100 fm
06.09.93	49	7.00	10.30	3.30	70 mm	None	32 fm	100 fm
06.09.93	51	15.00	18.30	3.30	70 mm	None	32 fm	100 fm
06.09.93	53	23.15	3.00	3.45	70 mm	None	32 fm	100 fm

Table 4.3.3. - Technical conditions during Sampling Campaign 28.08-09.09.93 (continued).
Partim : Hauls made for the analysis of Nephrops sexual maturity.

Date	Haul no.	Hour at start	Hour at end	Duration of haul	Mesh size cod-end	Mesh-size cover	Depth	Warp length
07.09.93	56	13.00	17.00	4.00	70 mm	None	33 fm	100 fm
08.09.93	60	5.30	9.00	3.30	70 mm	None	32 fm	100 fm

Table 4.3.4. - Nos. of *Nephrops* measured during Sampling Campaign 28.08-09.09.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Landings whole		Landings tails		Discards		Cod-end cover	
		SF (*)	No.	SF (*)	No.	SF (*)	No.	SF (*)	No.
01.09.93	21	1:2	227	1:6	251	1:9½	207		
02.09.93	23	1:4	383	1:6	283	1:24	301		
02.09.93	25	1:4	531	1:9	243	1:8	559		
02.09.93	26	1:3	300	1:3	382	1:6½	477		
02.09.93	28	1:8	288	1:6	301	1:6½	510		
03.09.93	30	1:3	362	1:3	245	2:3½	237		
03.09.93	31	1:6	307	1:6	233	1:15½	433		
03.09.93	33	1:2	242	1:2	259	1:4½	203		
04.09.93	35	1:7½	300	1:6	293	1:10	485		
04.09.93	36	1:6	314	1:6	242	1:9½	421		
04.09.93	38	1:6	274	1:5¼	317	1:18	590		
04.09.93	40	1:6	291	1:6	218	1:11¼	425		
05.09.93	44	1:7	440	1:8	254	1:21	610		
05.09.93	46	1:9	459	1:6	282	1:22	394		

(*) SF : Sampled fraction.

Table 4.3.4. - Nos. of *Nephrops* measured during Sampling Campaign 28.08-09.09.93 (continued)
 Partim : Hauls made for discard analysis (continued).

Date	Haul no.	Landings whole		Landings tails		Discards		Cod-end cover	
		SF (*)	No.	SF (*)	No.	SF (*)	No.	SF (*)	No.
06.09.93	48	1:5	462	1:7	231	1:12	400		
06.09.93	49	2:39	499	1:13	229	1:12½	1298		
06.09.93	51	2:31	442	1:10	264	1:27	450		
07.09.93	53	1:7½	261	1:4	234	1:16	339		
Totals			6382		4761		8339		
Raised			46.3		29.1		112.4		

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors, in thousands.

Table 4.3.4. - Nos. of *Nephrops* measured during Sampling Campaign 28.08-09.09.93 (continued)
 Partim : Hauls made for the analysis of *Nephrops* sexual maturity.

Date	Haul no.	♀♀ in landings		♀♀ in discards	
		SF (*)	No.	SF (*)	No.
07.09.93	56	1:1	1181	1:2	388
				1:4	246
08.09.93	60	1:2	995	1:1	522
		1:6	231	1:2	232
Totals			2407		1388

(*) SF : Sampled fraction.

Table 4.3.5. - Nos. of whiting measured during Sampling Campaign 28.08-09.09.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Landings		Discards	
		SF (*)	No.	SF (*)	No.
01.09.93	21	1:1	7	1:9½	182
02.09.93	23	1:1	22	1:6	63
02.09.93	25	1:1	33	1:4	168
02.09.93	26	1:1	12	2:6½	149
02.09.93	28	1:1	8	4:6½	196
03.09.93	30	1:1	9	2:3½	97
03.09.93	31	1:1	12	2:10½	210
03.09.93	33	1:1	47	1:4½	303
04.09.93	35	1:1	18	1:5	185
04.09.93	36	1:1	16	2:9½	183
04.09.93	38	1:1	21	1:6	204
04.09.93	40	1:1	9	2:7½	86
05.09.93	44	1:1	67	1:3½	269
05.09.93	46	1:1	53	2:5½	278
06.09.93	48	1:1	74	1:3	250
06.09.93	49	1:1	24	2:12½	233
06.09.93	51	1:1	8	1:4½	102
07.09.93	53	1:1	20	1:4	94
Totals			460		3252
Raised			460		14305

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.3.6. - Nos. of cod measured during Sampling Campaign 28.08-09.09.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Landings		Discards	
		SF (*)	No.	SF (*)	No.
01.09.93	21	1:1	10	2:9½	2
02.09.93	23	1:1	7	1:6	-
02.09.93	25	1:1	19	1:2	3
02.09.93	26	1:1	15	4:6½	-
02.09.93	28	1:1	9	4:6½	2
03.09.93	30	1:1	7	1:1	-
03.09.93	31	1:1	8	4:10½	-
03.09.93	33	1:1	8	2:4½	-
04.09.93	35	1:1	10	1:2½	-
04.09.93	36	1:1	8	4:9½	-
04.09.93	38	1:1	13	1:3	-
04.09.93	40	1:1	9	4:7½	-
05.09.93	44	1:1	5	1:3½	1
05.09.93	46	1:1	3	2:5½	-
06.09.93	48	1:1	10	1:3	3
06.09.93	49	1:1	21	2:12½	-
06.09.93	51	1:1	8	1:4½	2
07.09.93	53	1:1	5	1:4	3
Totals			175		16
Raised			175		52

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.3.7. - Nos. of gurnards measured during Sampling Campaign 28.08-09.09.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Landings		Discards	
		SF (*)	No.	SF (*)	No.
01.09.93	21	1:1	2	2:9½	4
02.09.93	23	1:1	3	1:6	9
02.09.93	25	1:1	-	1:2	6
02.09.93	26	1:1	-	4:6½	11
02.09.93	28	1:1	-	4:6½	2
03.09.93	30	1:1	3	1:1	9
03.09.93	31	1:1	2	4:10½	15
03.09.93	33	1:1	-	2:4½	8
04.09.93	35	1:1	1	1:2½	3
04.09.93	36	1:1	-	4:9½	-
04.09.93	38	1:1	-	1:3	6
04.09.93	40	1:1	-	4:7½	-
05.09.93	44	1:1	2	1:3½	7
05.09.93	46	1:1	-	2:5½	3
06.09.93	48	1:1	1	1:3	-
06.09.93	49	1:1	1	2:12½	4
06.09.93	51	1:1	1	1:4½	1
07.09.93	53	1:1	2	1:4	1
Totals			18		89
Raised			18		264

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.3.8. - Nos. of dab measured during Sampling Campaign 28.08-09.09.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Landings		Discards	
		SF (*)	No.	SF (*)	No.
01.09.93	21	1:1	7	1:19	245
02.09.93	23	1:1	4	1:24	143
02.09.93	25	1:1	4	1:2	102
02.09.93	26	1:1	-	4:6½	46
02.09.93	28	1:1	1	4:6½	36
03.09.93	30	1:1	-	1:1	46
03.09.93	31	1:1	2	4:10½	63
03.09.93	33	1:1	1	1:4½	102
04.09.93	35	1:1	1	1:2½	26
04.09.93	36	1:1	3	4:9½	44
04.09.93	38	1:1	1	1:3	38
04.09.93	40	1:1	-	4:7½	33
05.09.93	44	1:1	5	1:3½	90
05.09.93	46	1:1	2	2:5½	165
06.09.93	48	1:1	1	1:3	33
06.09.93	49	1:1	1	2:12½	131
06.09.93	51	1:1	-	1:4½	75
07.09.93	53	1:1	2	1:4	152
Totals			35		1570
Raised			35		12072

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.3.9. - Nos. of plaice measured during Sampling Campaign 28.08-09.09.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Landings		Discards	
		SF (*)	No.	SF (*)	No.
01.09.93	21	1:1	40	2:9½	-
02.09.93	23	1:1	19	1:6	-
02.09.93	25	1:1	64	1:2	2
02.09.93	26	1:1	49	4:6½	1
02.09.93	28	1:1	68	4:6½	1
03.09.93	30	1:1	23	1:1	5
03.09.93	31	1:1	26	4:10½	1
03.09.93	33	1:1	85	2:4½	9
04.09.93	35	1:1	30	1:2½	2
04.09.93	36	1:1	14	4:9½	-
04.09.93	38	1:1	16	1:3	-
04.09.93	40	1:1	21	4:7½	2
05.09.93	44	1:1	13	1:3½	-
05.09.93	46	1:1	15	2:5½	4
06.09.93	48	1:1	83	1:3	2
06.09.93	49	1:1	196	2:12½	3
06.09.93	51	1:1	102	1:4½	3
07.09.93	53	1:1	113	1:4	1
Totals			977		36
Raised			977		97

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.3.10. - Nos. of sole measured during Sampling Campaign 28.08-09.09.93.
Partim : Hauls made for discard analysis.

Date	Haul no.	Landings		Discards	
		SF (*)	No.	SF (*)	No.
01.09.93	21	1:1	37	1:1	4
02.09.93	23	1:1	24	1:1	1
02.09.93	25	1:1	16	1:2	-
02.09.93	26	1:1	4	4:6½	-
02.09.93	28	1:1	13	4:6½	-
03.09.93	30	1:1	5	1:1	-
03.09.93	31	1:1	8	4:10½	-
03.09.93	33	1:1	9	2:4½	-
04.09.93	35	1:1	5	1:2½	-
04.09.93	36	1:1	13	4:9½	-
04.09.93	38	1:1	4	1:3	-
04.09.93	40	1:1	1	4:7½	-
05.09.93	44	1:1	8	1:3½	-
05.09.93	46	1:1	11	1:1	2
06.09.93	48	1:1	14	1:1	2
06.09.93	49	1:1	12	2:12½	-
06.09.93	51	1:1	10	1:4½	-
07.09.93	53	1:1	11	1:4	-
Totals			205		9
Raised			205		9

(*) SF : Sampled fraction.

Raised : Totals of the numbers measured, raised by the corresponding sampling factors.

Table 4.3.11. - Sampling Campaign 28.08-09.09.93 : Data sets of 6 hauls each, covering a period of 24 hours.

Data set	Species	Hauls
1	Nephrops and fish	21 + 23 + 25 + 26 + 28 + 30
2	Nephrops and fish	31 + 33 + 35 + 36 + 38 + 40
3	Nephrops and fish	44 + 46 + 48 + 49 + 51 + 53

Table 5.1.1.1. (a) : Nephrops selectivity parameters - haul by haul

Campaign	haul no.	L25	Conf. int.		L50	Conf. int.		L75	Conf. int.		Mesh size	Sel. Factor	Sel. range	α	β	Deviance	df.	seastate
1	2	27.8	27.1	28.4	37.0	36.2	37.8	46.1	44.7	47.8	67.3	0.55	18.3	0.12	-4.426	25.38	12	mod
1	4	28.3	27.8	28.8	35.6	35.2	36.1	42.9	42.1	43.8	67.3	0.53	14.6	0.151	-5.36	79.44	11	mod
1	7	27.1	26.0	28.0	34.7	34.1	35.5	42.4	41.2	43.8	67.3	0.52	15.3	0.144	-4.993	16.56	10	sli
1	9	12.8	10.5	14.7	24.8	23.8	25.6	36.7	35.7	38.0	67.3	0.37	23.9	0.092	-2.279	48.19	13	smo
1	12	-22.5	-50.3	-8.9	4.8	-8.7	11.4	32.1	30.2	34.5	67.3	0.07	54.5	0.04	-0.193	72.33	12	cal
1	13	20.1	18.2	21.5	28.6	27.7	29.3	37.1	36.1	38.2	67.3	0.42	17.0	0.129	-3.692	75.17	10	cal
1	15	22.9	21.9	23.9	31.5	31.0	32.0	40.0	39.2	41.0	67.3	0.47	17.1	0.129	-4.049	84.82	11	cal
1	18	28.4	27.6	29.1	34.3	33.8	34.8	40.2	39.4	41.1	67.3	0.51	11.8	0.187	-6.396	76.35	10	smo
1	19	24.3	23.2	25.3	30.5	29.9	31.1	36.8	36.0	37.7	67.3	0.45	12.4	0.177	-5.407	23.24	9	smo
1	20	20.5	18.3	22.2	28.1	27.2	29.0	35.8	34.8	37.1	67.3	0.42	15.3	0.144	-4.046	33.35	9	cal
1	23	22.9	21.7	23.8	30.3	29.8	30.9	37.8	37.0	38.8	67.3	0.45	14.9	0.147	-4.461	28.45	10	smo
1	24	23.0	21.9	24.0	29.4	28.8	29.9	35.8	35.0	36.6	67.3	0.44	12.7	0.173	-5.079	47.47	10	sli
1	25	21.9	20.0	23.4	29.0	28.1	29.8	36.0	35.0	37.3	67.3	0.43	14.1	0.156	-4.523	20.06	9	sli
1	29	17.4	16.4	18.2	25.9	25.5	26.3	34.4	33.9	35.0	67.3	0.39	17.0	0.129	-3.344	77.56	12	cal
1	31	6.6	0.4	10.8	18.1	14.6	20.5	29.6	28.2	30.8	67.3	0.27	23.0	0.096	-1.726	46.33	11	cal
1	32	11.4	9.4	13.1	20.6	19.5	21.4	29.7	29.2	30.3	67.3	0.31	18.3	0.12	-2.475	63.97	12	cal
1	39	16.2	13.7	18.2	26.4	25.2	27.5	36.6	35.7	37.8	79.0	0.33	20.5	0.107	-2.839	29.26	12	smo
1	41	15.3	13.8	16.5	22.0	21.2	22.7	28.7	28.3	29.2	79.0	0.28	13.4	0.164	-3.605	69.83	10	smo
1	42	8.3	3.2	11.9	20.8	18.3	22.6	33.2	32.1	34.5	79.0	0.26	24.9	0.088	-1.829	32.56	12	sli
1	43	18.7	15.0	21.2	29.0	27.5	30.2	39.3	37.7	41.5	79.0	0.37	20.5	0.107	-3.101	50.15	10	sli
1	47	22.5	21.1	23.7	33.0	32.3	33.7	43.5	42.3	44.9	79.0	0.42	20.9	0.105	-3.463	75.62	11	smo
1	49	12.2	-26.3	21.2	25.6	9.6	30.0	39.1	35.8	48.5	79.0	0.32	27.0	0.082	-2.091	14.56	5	smo
1	50	24.9	23.7	25.9	30.5	29.8	31.2	36.2	35.4	37.1	79.0	0.39	11.3	0.195	-5.959	22.13	9	smo
1	51	23.1	21.9	24.1	32.5	31.8	33.2	41.8	40.7	43.2	79.0	0.41	18.7	0.117	-3.812	88.33	13	cal
1	52	27.4	26.1	28.4	35.0	34.2	35.8	42.6	41.4	44.0	79.0	0.44	15.3	0.144	-5.038	34.69	11	cal
2	25	26.2	24.2	27.7	35.0	34.0	36.2	43.7	41.8	46.5	67.3	0.52	17.5	0.126	-4.399	38.71	8	sli
2	27	14.9	11.4	17.6	26.6	25.0	27.8	38.2	37.0	39.6	67.3	0.39	23.3	0.095	-2.51	54.14	11	mod
2	30	29.0	27.7	29.9	33.9	33.2	34.6	38.8	37.9	40.0	67.3	0.50	9.9	0.223	-7.549	33.56	7	mod
2	32	23.9	17.6	27.2	31.2	28.3	33.2	38.5	36.6	41.5	67.3	0.46	14.6	0.15	-4.688	5.06	5	mod
2	35	28.0	26.9	28.9	36.6	35.9	37.3	45.2	43.9	46.7	67.3	0.54	17.2	0.128	-4.672	49.24	12	rou
2	36	34.4	33.4	35.3	40.0	39.0	41.1	45.6	44.1	47.5	67.3	0.59	11.2	0.196	-7.84	7.37	8	rou
2	37	25.4	23.1	27.2	38.8	37.5	40.5	52.2	49.2	56.5	67.3	0.58	26.8	0.082	-3.185	21.41	11	rou
2	40	19.4	16.0	21.8	31.6	30.4	32.8	43.9	41.7	47.0	67.3	0.47	24.5	0.09	-2.841	28.19	11	mod
2	41	24.4	20.8	26.7	33.3	31.8	34.8	42.2	40.0	45.7	67.3	0.50	17.8	0.123	-4.111	15.1	9	mod
2	42	23.9	22.7	24.9	31.1	30.4	31.7	38.2	37.4	39.3	67.3	0.46	14.3	0.153	-4.763	29.5	11	sli
2	45	24.6	22.5	26.1	30.4	29.2	31.4	36.2	35.1	37.5	67.3	0.45	11.6	0.189	-5.734	11.11	6	sli
2	47	23.7	15.9	27.5	36.6	33.4	42.2	49.5	43.5	64.5	67.3	0.54	25.8	0.085	-3.121	14.16	4	mod
2	48	32.0	30.3	33.5	38.2	36.6	40.1	44.4	42.1	47.6	67.3	0.57	13.4	0.178	-6.794	5.41	2	mod
2	49	23.2	21.5	24.5	32.1	31.2	33.0	41.0	39.6	42.8	67.3	0.48	17.8	0.123	-3.959	24.89	11	sli
2	51	26.3	25.4	27.1	32.9	32.3	33.5	39.5	38.6	40.6	67.3	0.49	13.2	0.167	-5.49	30.23	10	sli
2	52	16.9	7.0	21.6	25.7	20.6	28.4	34.5	32.3	37.2	67.3	0.38	17.6	0.125	-3.212	13.33	6	sli
2	54	17.6	10.5	21.7	26.9	23.4	29.1	36.2	34.6	38.3	67.3	0.40	18.6	0.118	-3.184	20.83	8	mod
2	55	28.4	27.5	29.2	34.1	33.6	34.6	39.8	39.1	40.7	67.3	0.51	11.4	0.193	-6.572	17.19	9	mod
2	57	31.3	30.4	32.0	38.4	37.7	39.1	45.5	44.3	46.9	67.3	0.57	14.2	0.155	-5.931	26.64	11	mod

Table 5.1.1.1. (b) : Nephrops selectivity parameters - combined hauls

Data set	L25	L50	L75	Mesh size	Sel. Factor	Sel. range	α	β
Square mesh window (70mm)	21.4	31.0	40.6	67.3	0.46	19.1	0.115	-3.563
No window (70mm)	19.2	29.4	39.6	67.3	0.44	20.4	0.1078	-3.1687
No window (90mm)	17.9	27.6	37.4	79.0	0.35	19.5	0.113	-3.12
seastate calm	13.7	24.4	35.1	67.3	0.36	21.4	0.103	-2.508
seastate smooth	20.2	29.4	38.6	67.3	0.44	18.4	0.119	-3.504
seastate slight	24.4	31.5	38.6	67.3	0.47	14.2	0.155	-4.881
seastate moderate	26.7	34.4	42.2	67.3	0.51	15.5	0.142	-4.881
seastate rough	28.8	37.7	46.6	67.3	0.56	17.8	0.124	-4.658
All hauls (70mm)	20.2	30.1	39.9	67.3	0.45	19.7	0.112	-3.361

Table 5.1.2.1. : Whiting selectivity parameters - combined hauls

Data set	L25	L50	L75	Mesh size	Sel. Factor	Sel. range	α	β
Square mesh window (70mm)	26.5	31.8	37.0	67.3	4.73	10.5	0.2099	-6.6675
No window (70mm)	24.4	27.8	31.1	67.3	4.13	6.8	0.3248	-9.016
No window (90mm)	21.7	27.5	33.3	79.0	3.48	11.6	0.1886	-5.1852

Table 5.2.1.1. - Fishermen's selection curves for *Nephrops*.
Partim : Sampling Campaign 2.

Campaign and data set	Sex	Curve	α	β	L50
C 2 S 1	Males	Logit	0.336	- 9.700	28.9
		Probit	0.219	- 6.304	28.9
		C Log Log	0.223	- 6.903	29.3
		Log Log	0.278	- 7.610	28.6
C 2 S 1	Females	Logit	0.261	- 7.820	30.0
		Probit	0.234	- 6.976	29.7
		C Log Log	0.264	- 8.325	30.1
		Log Log	0.185	- 5.085	29.5
C 2 S 2	Males	Logit	0.442	-12.632	28.6
		Probit	0.300	- 8.631	28.8
		C Log Log	0.315	- 9.505	29.0
		Log Log	0.368	-10.040	28.3
C 2 S 2	Females	Logit	0.328	- 9.369	28.6
		Probit	0.197	- 5.605	28.5
		C Log Log	0.238	- 7.244	28.9
		Log Log	0.244	- 6.512	28.2
C 2 S 3	Males	Logit	0.410	-11.763	28.7
		Probit	0.316	- 9.112	28.8
		C Log Log	0.319	- 9.729	29.3
		Log Log	0.335	- 9.137	28.3
C 2 S 3	Females	Logit	0.311	- 9.064	29.1
		Probit	0.216	- 6.266	29.1
		C Log Log	0.260	- 8.033	29.5
		Log Log	0.228	- 6.172	28.6

Table 5.2.1.1. - Fishermen's selection curves for
Nephrops (continued).
 Partim : Sampling Campaign 2 (continued)

Campaign and data set	Sex	Curve	α	β	L50
C 2 All sets combined	Males	Logit	0.393	-11.286	28.7
		Probit	0.274	- 7.882	28.8
		C Log Log	0.287	- 8.748	29.2
		Log Log	0.321	- 8.750	28.4
C 2 All sets combined	Females	Logit	0.307	- 8.840	28.8
		Probit	0.199	- 5.715	28.8
		C Log Log	0.237	- 7.273	29.1
		Log Log	0.224	- 6.016	28.4

Table 5.2.1.1. - Fishermen's selection curves for
Nephrops (continued).
 Partim : Sampling Campaign 3.

Campaign and data set	Sex	Curve	α	β	L50
C 3 S 1	Males	Logit	0.482	-15.627	32.4
		Probit	0.302	- 9.830	32.6
		C Log Log	0.351	-11.910	32.9
		Log Log	0.380	-11.824	32.1
C 3 S 1	Females	Logit	0.417	-13.591	32.6
		Probit	0.271	- 8.785	32.4
		C Log Log	0.348	-11.781	32.8
		Log Log	0.293	- 9.046	32.1
C 3 S 2	Males	Logit	0.547	-18.255	33.4
		Probit	0.336	-11.203	33.3
		C Log Log	0.441	-15.219	33.7
		Log Log	0.404	-12.943	33.0
C 3 S 2	Females	Logit	0.522	-17.575	33.7
		Probit	0.346	-11.578	33.5
		C Log Log	0.458	-15.830	33.8
		Log Log	0.362	-11.667	33.2
C 3 S 3	Males	Logit	0.558	-18.932	33.9
		Probit	0.364	-12.350	34.0
		C Log Log	0.436	-15.289	34.2
		Log Log	0.437	-14.289	33.6
C 3 S 3	Females	Logit	0.484	-16.435	34.0
		Probit	0.318	-10.692	33.7
		C Log Log	0.449	-15.634	34.0
		Log Log	0.335	-10.822	33.4

Table 5.2.1.1. - Fishermen's selection curves for
Nephrops (continued).
 Partim : Sampling Campaign 3 (continued)

Campaign and data set	Sex	Curve	α	β	L50
C 3 All sets combined	Males	Logit	0.530	-17.692	33.4
		Probit	0.343	-11.475	33.5
		C Log Log	0.409	-14.166	33.8
		Log Log	0.413	-13.296	33.1
C 3 All sets combined	Females	Logit	0.469	-15.792	33.7
		Probit	0.307	-10.263	33.4
		C Log Log	0.416	-14.399	33.7
		Log Log	0.327	-10.463	33.1

Table 5.2.2.1. - Fishermen's selection curves for whiting.

Species	Campaign and data set	Curve	α	β	L50
Whiting	C 2 S 1	Logit	0.747	-22.231	29.8
		Probit	0.402	-12.004	29.8
		C Log Log	0.572	-17.483	29.9
		Log Log	Not calculated		
Whiting	C 2 S 2	Logit	0.846	-25.059	29.6
		Probit	0.491	-14.538	29.6
		C Log Log	0.720	-21.743	29.7
		Log Log	Not calculated		
Whiting	C 2 S 3	Logit	0.769	-22.873	29.8
		Probit	0.443	-13.158	29.7
		C Log Log	0.699	-21.118	29.7
		Log Log	Not calculated		
Whiting	C 2 All sets combined	Logit	0.774	-23.028	29.7
		Probit	0.440	-13.080	29.7
		C Log Log	0.675	-20.441	29.7
		Log Log	Not calculated		

Table 5.2.2.1. - Fishermen's selection curves for whiting (continued).

Species	Campaign and data set	Curve	α	β	L50
Whiting	C 3 S 1	Logit	0.780	-26.476	34.0
		Probit	0.372	-12.746	34.3
		C Log Log	0.738	-25.288	33.8
		Log Log	Not calculated		
Whiting	C 3 S 2	Logit	0.813	-26.368	32.5
		Probit	0.393	-12.853	32.7
		C Log Log	0.772	-25.263	32.3
		Log Log	Not calculated		
Whiting	C 3 S 3	Logit	0.687	-22.860	33.3
		Probit	0.375	-12.524	33.4
		C Log Log	0.618	-20.894	33.2
		Log Log	Not calculated		
Whiting	C 3 All sets combined	Logit	0.732	-24.369	33.3
		Probit	0.372	-12.443	33.5
		C Log Log	0.682	-22.960	33.1
		Log Log	Not calculated		

Table 5.2.2.2. - Fishermen's selection curves for cod, gurnards, dab, plaice and sole.

Species	Campaign and data set	Curve	α	β	L50
Cod	C 2 C 3 All sets combined	Logit	1.741	-60.970	35.0
		Probit	0.822	-28.745	35.0
		C Log Log	Not calculated		
		Log Log	Not calculated		
Gurnards	C 2 C 3 All sets combined	Logit	0.927	-25.342	27.4
		Probit	0.505	-13.800	27.3
		C Log Log	0.836	-23.213	27.3
		Log Log	0.593	-15.713	27.1
Dab	C 2 C 3 All sets combined	Logit	2.104	-56.960	27.1
		Probit	1.133	-30.606	27.0
		C Log Log	Not calculated		
		Log Log	Not calculated		
Plaice	C 2 C 3 All sets combined	Logit	1.502	-40.010	26.6
		Probit	0.884	-23.496	26.6
		C Log Log	Not calculated		
		Log Log	Not calculated		
Sole	C 2 C 3 All sets combined	Logit	2.580	-62.028	24.0
		Probit	1.513	-36.167	23.9
		C Log Log	Not calculated		
		Log Log	Not calculated		

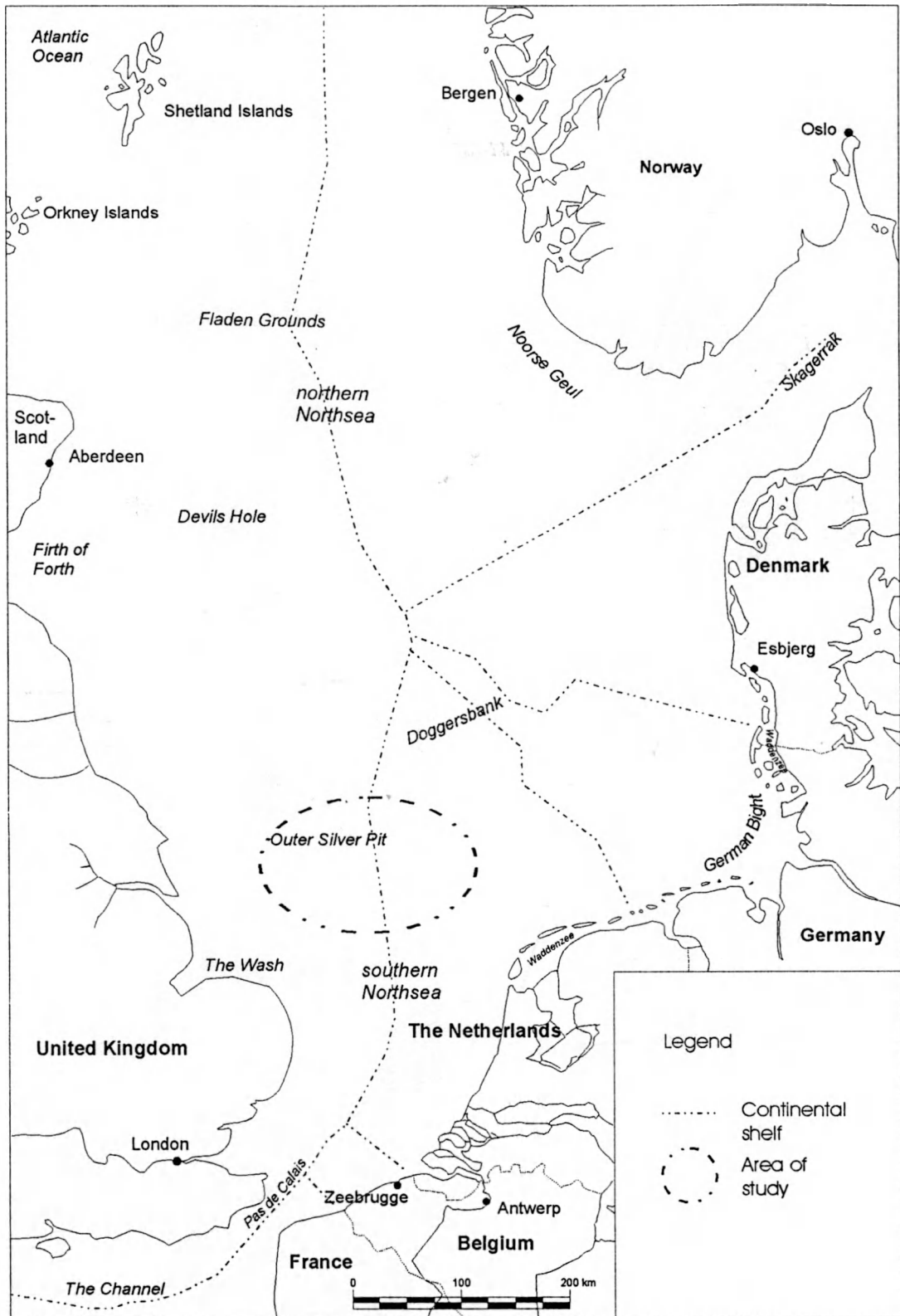


Figure 3.1.1. : Location of fishing areas

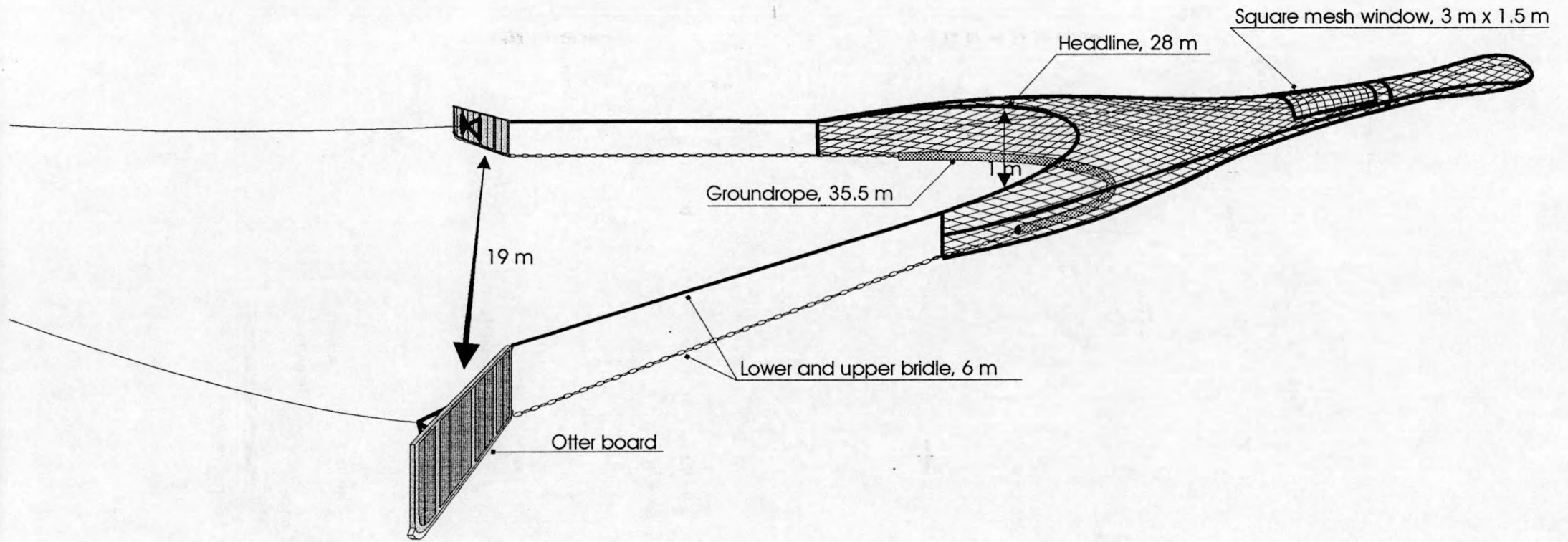


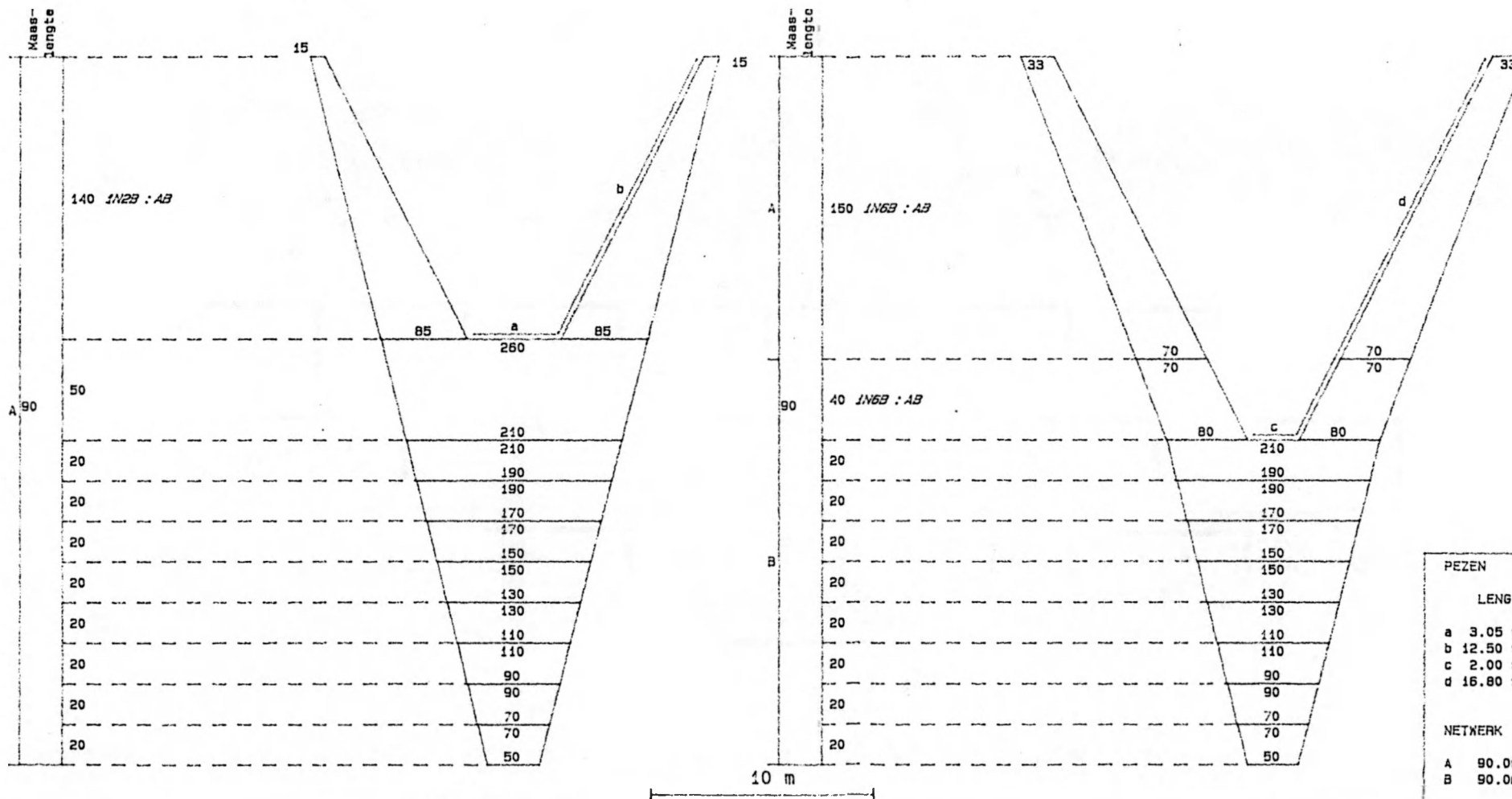
Figure 3.3.1. : The Belgian *Nephrops* otter trawl

Figure 3.3.2. : Netplan of the Nephrops trawl

28.00



35.50



PEZEN		
	LENGTE	MATERIAAL DIAM
a	3.05 m	0.00
b	12.50 m	0.00
c	2.00 m	0.00
d	16.80 m	0.00
NETWERK		
A	90.0mm.	0.0 mm. PE
B	90.0mm.	0.0 mm. PEDEL

Rijksstation voor Zeevisserij Ankerstraat 1, 8400 Oostende tel: (059) 32 08 05 - 32 03 88 Copyright du logiciel: CENTRE NATIONAL DE LA MER / IFREMER	Ref : SK001	NET 28.00m. / 35.50m.	1 YAARTUIG Opk
	Datum :	Type : Demersal otter trawl Soorten : Nephrops norvegicus Oorsprong : 0.306	

Selectivity studies Nephrops fishery

Sampled fractions marked with (■)

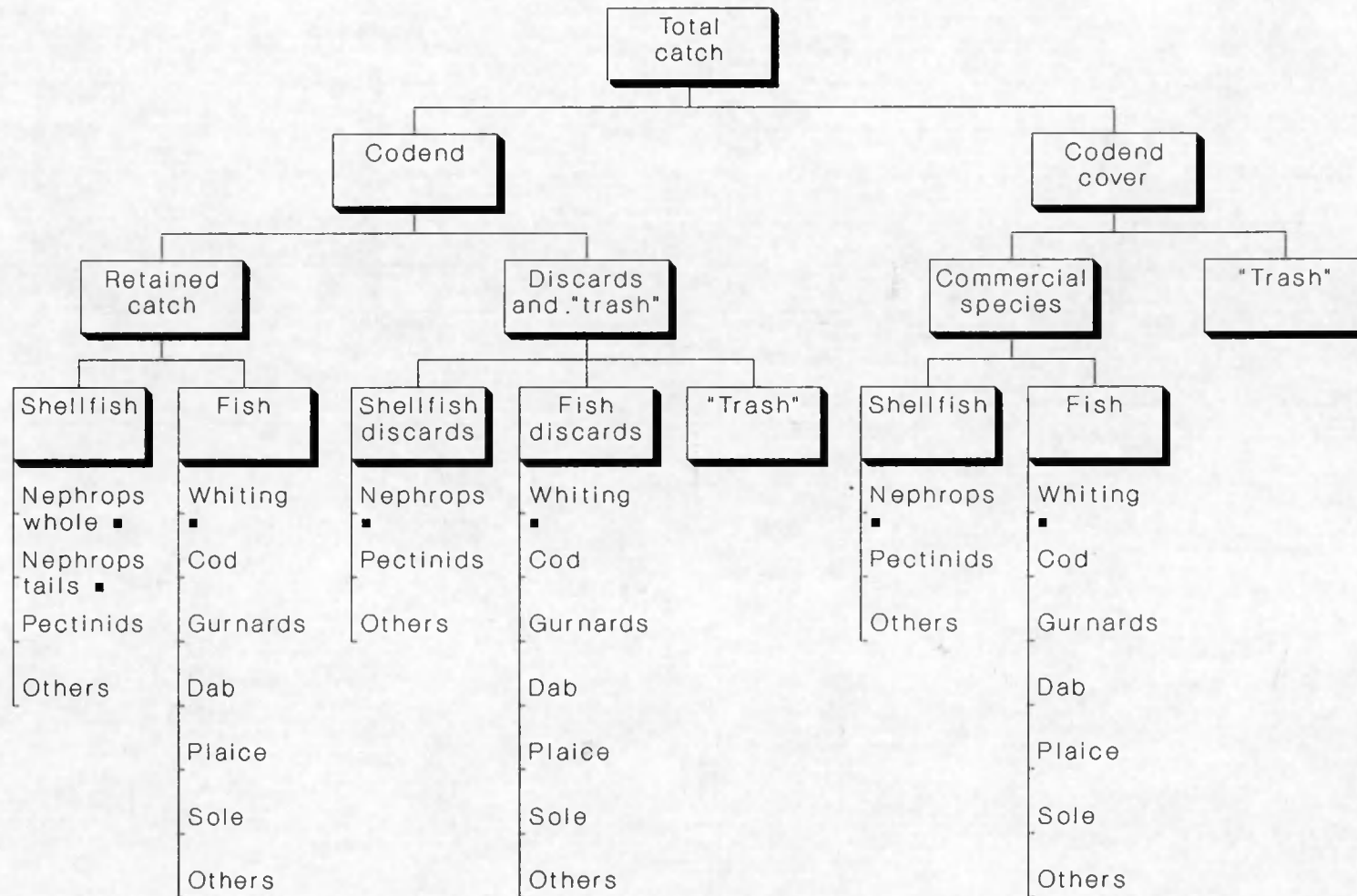


Figure 3.4.1.1.

Discard studies Nephrops fishery

Sampled fractions marked with (■)

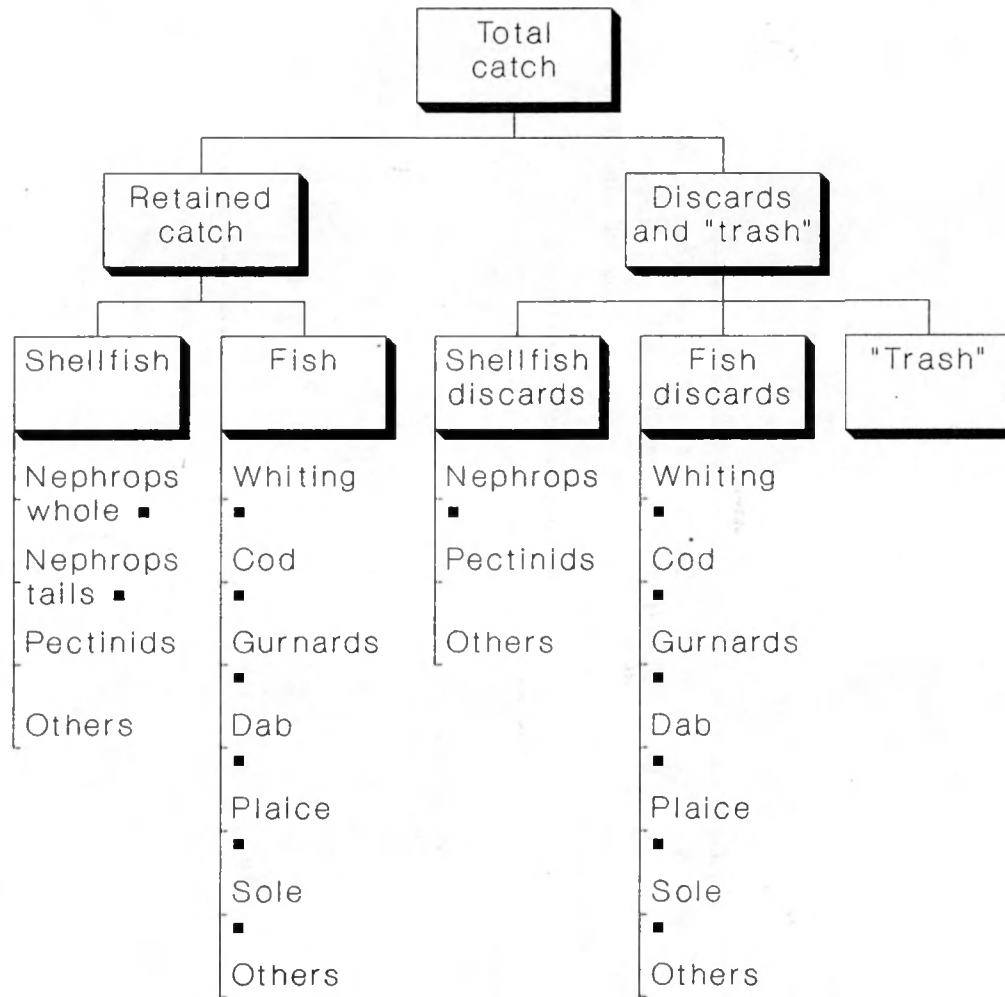


Figure 3.5.1.1.

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 2

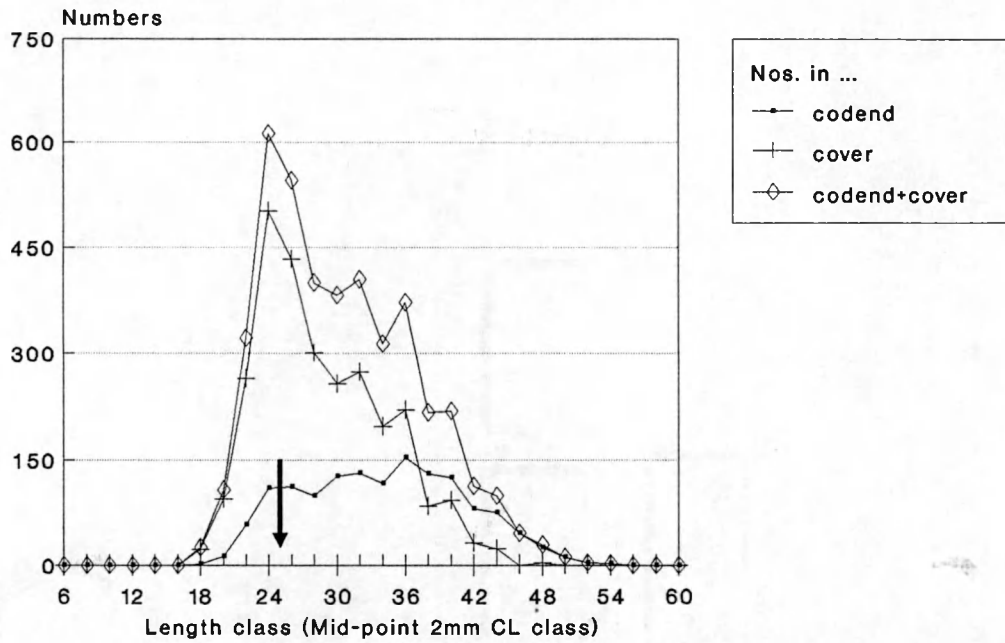


Figure 5.1.1.1.

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 1 : Haul 2

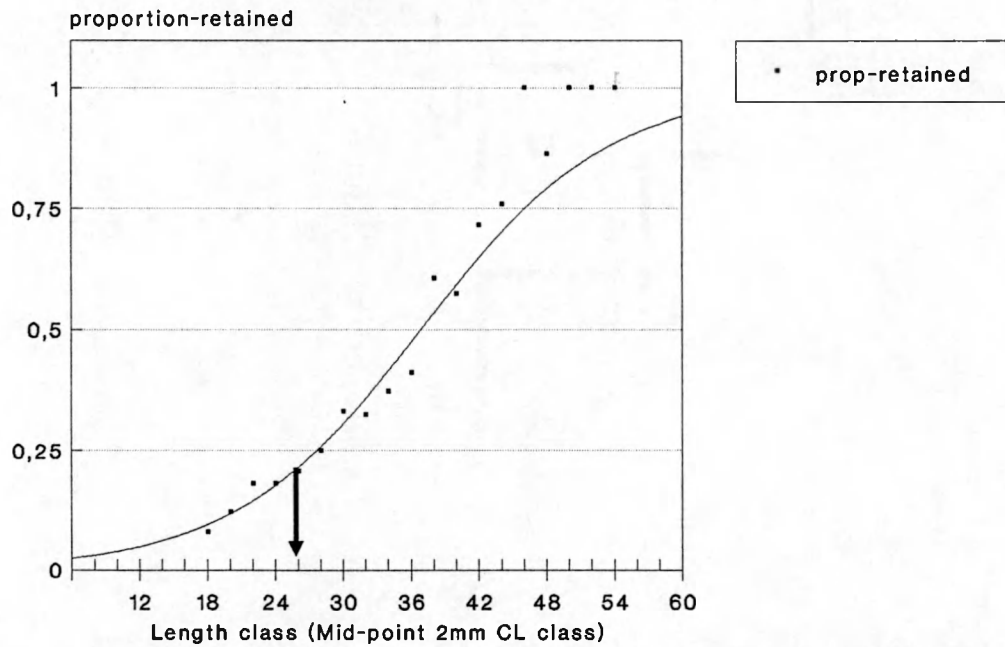
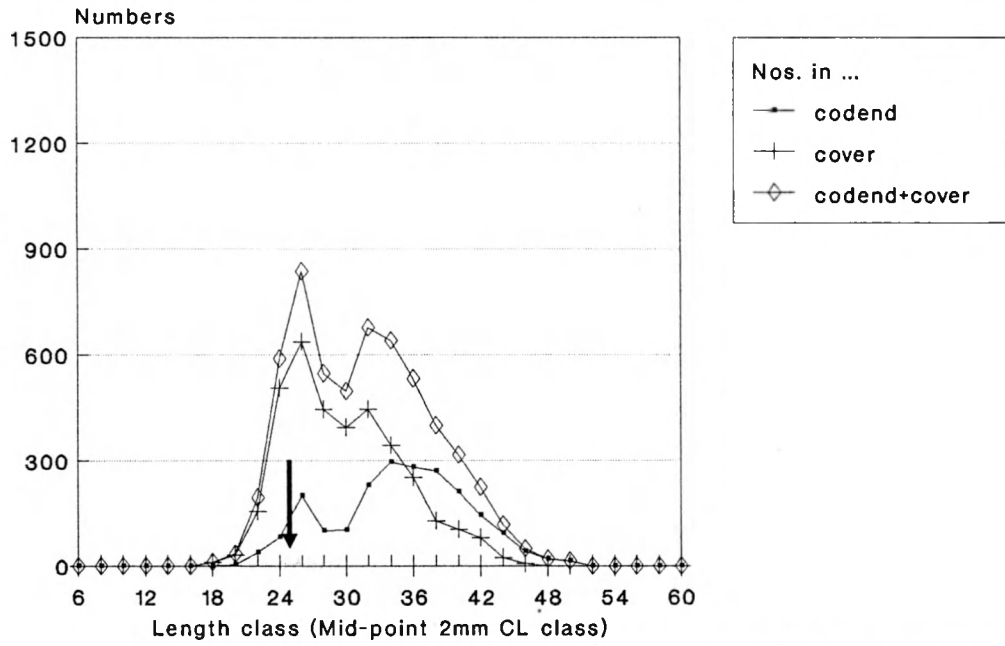


Figure 5.1.1.2.

Arrow indicates minimum landing size

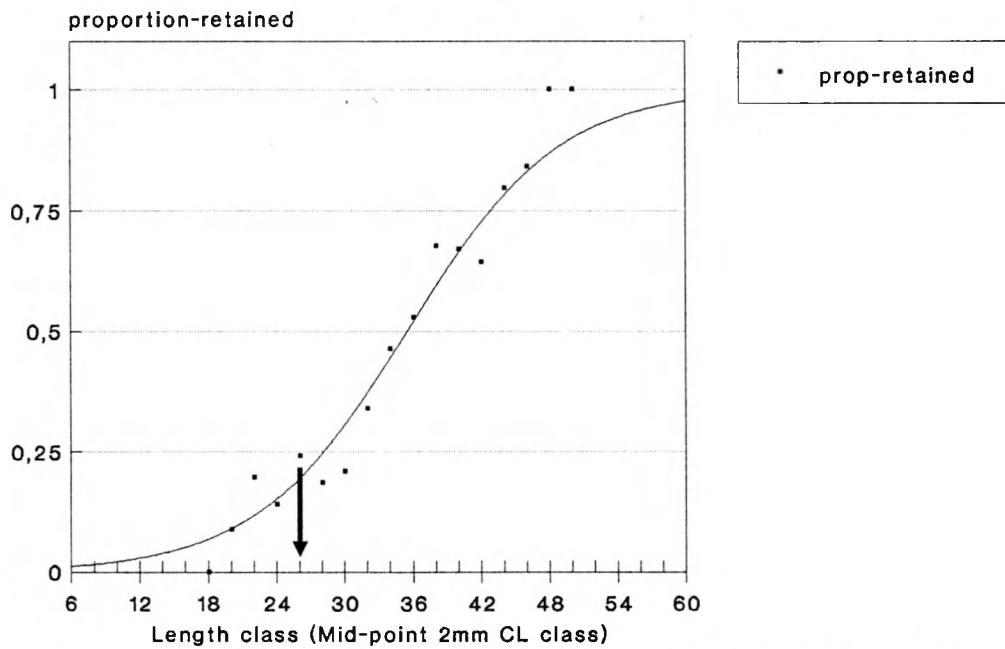
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 4



Arrow indicates minimum landing size

Figure 5.1.1.3.

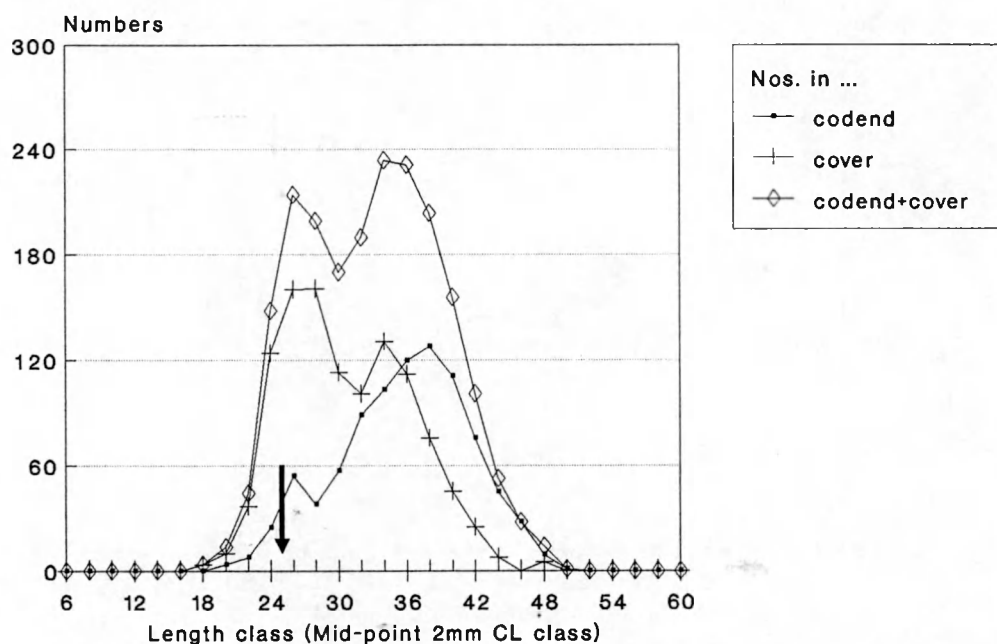
Nephrops selectivity study
 Campaign 1 : Haul 4



Arrow indicates minimum landing size

Figure 5.1.1.4.

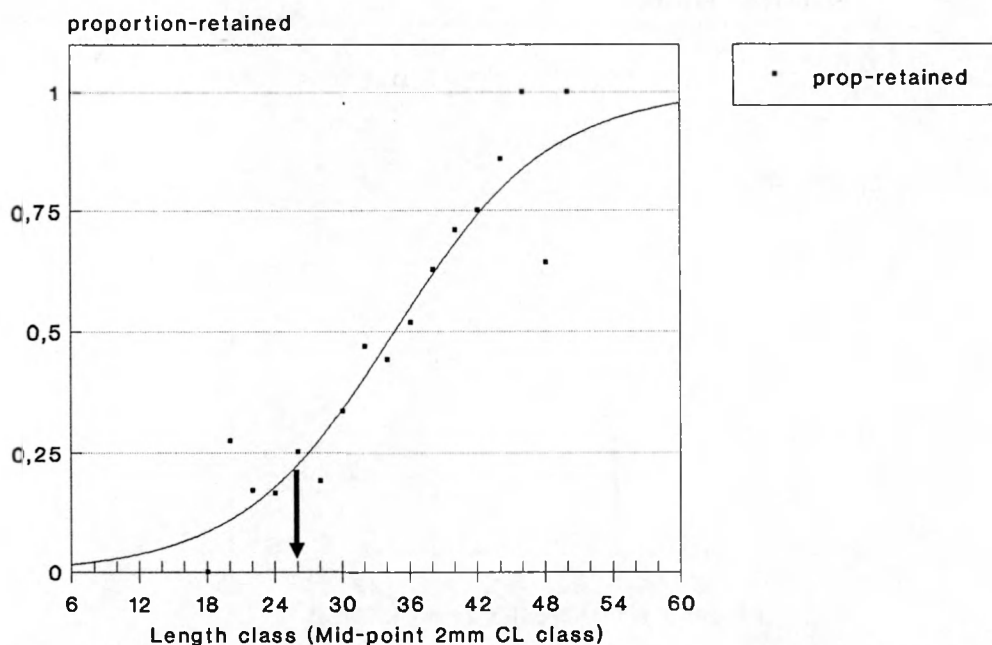
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 7



Arrow indicates minimum landing size

Figure 5.1.1.5.

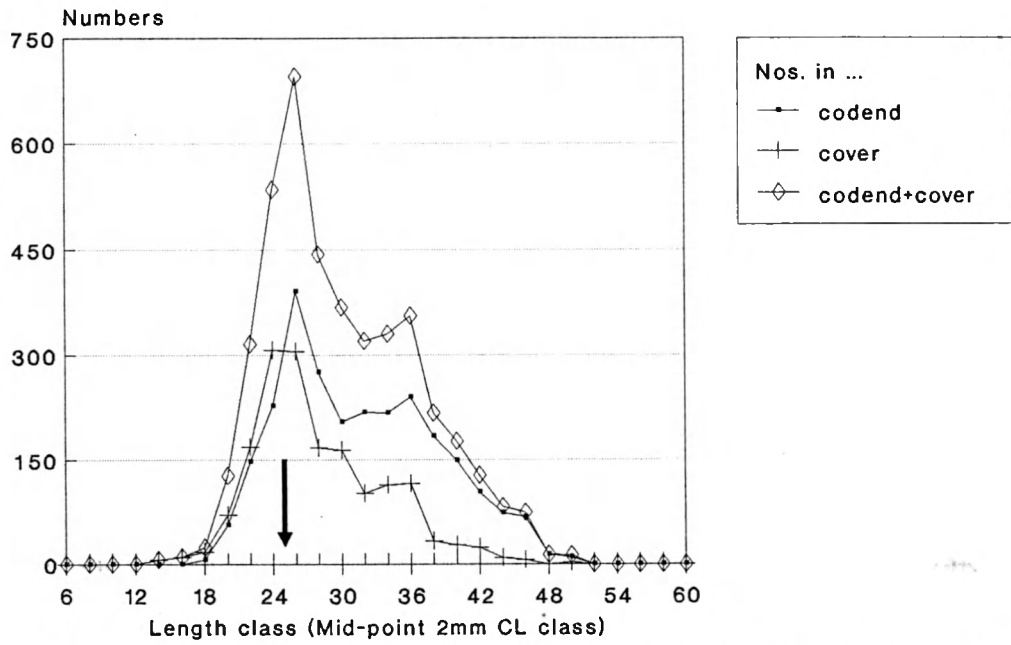
Nephrops selectivity study
 Campaign 1 : Haul 7



Arrow indicates minimum landing size

Figure 5.1.1.6.

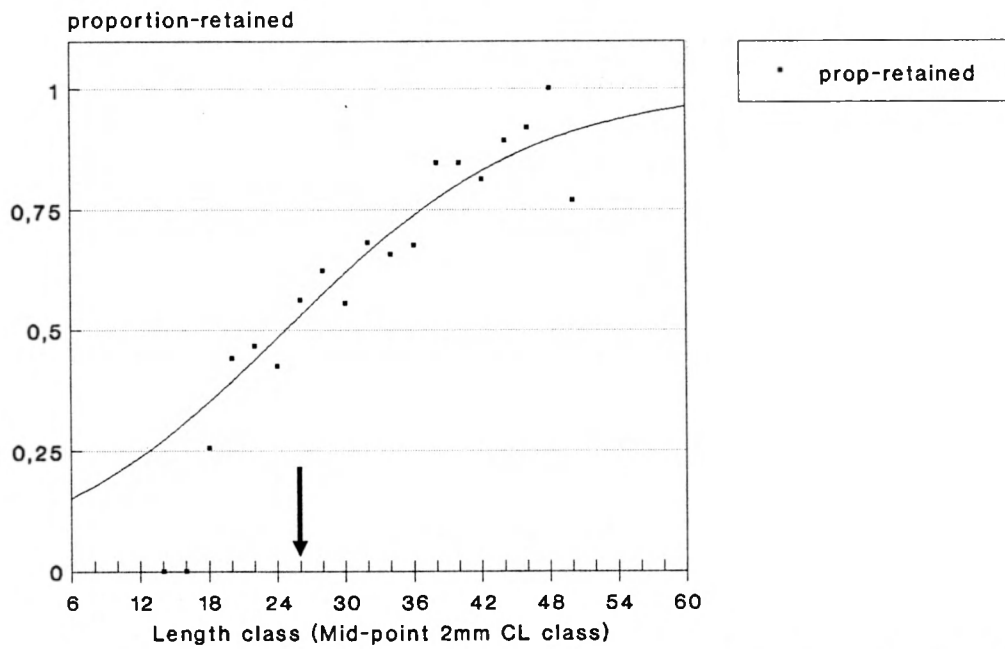
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 9



Arrow indicates minimum landing size

Figure 5.1.1.7.

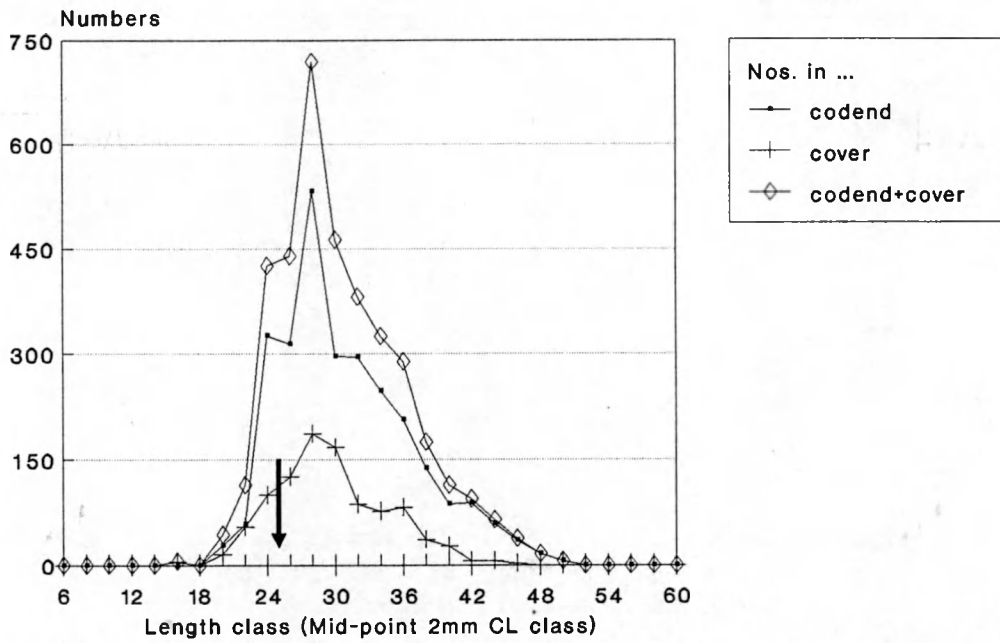
Nephrops selectivity study
 Campaign 1 : Haul 9



Arrow indicates minimum landing size

Figure 5.1.1.8.

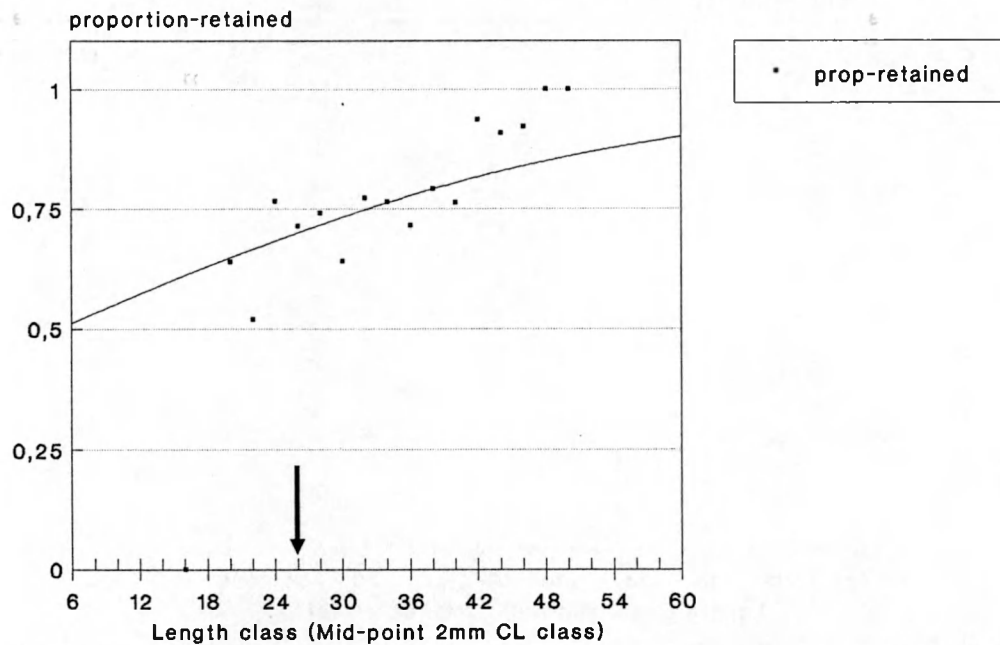
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 12



Arrow indicates minimum landing size

Figure 5.1.1.9.

Nephrops selectivity study
 Campaign 1 : Haul 12



Arrow indicates minimum landing size

Figure 5.1.1.10

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 13

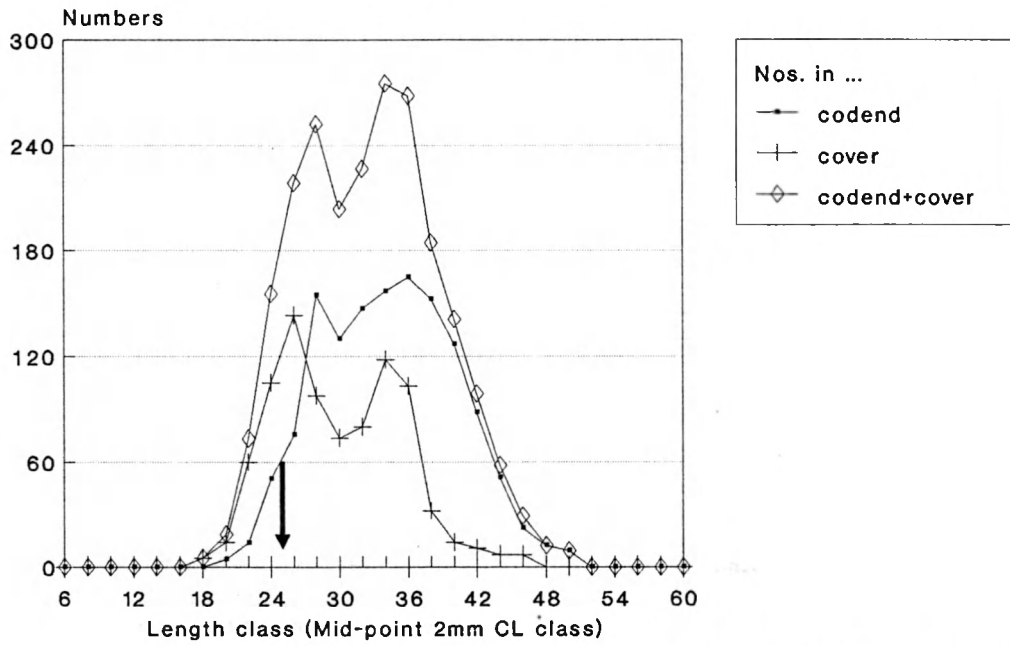


Figure 5.1.1.11

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 1 : Haul 13

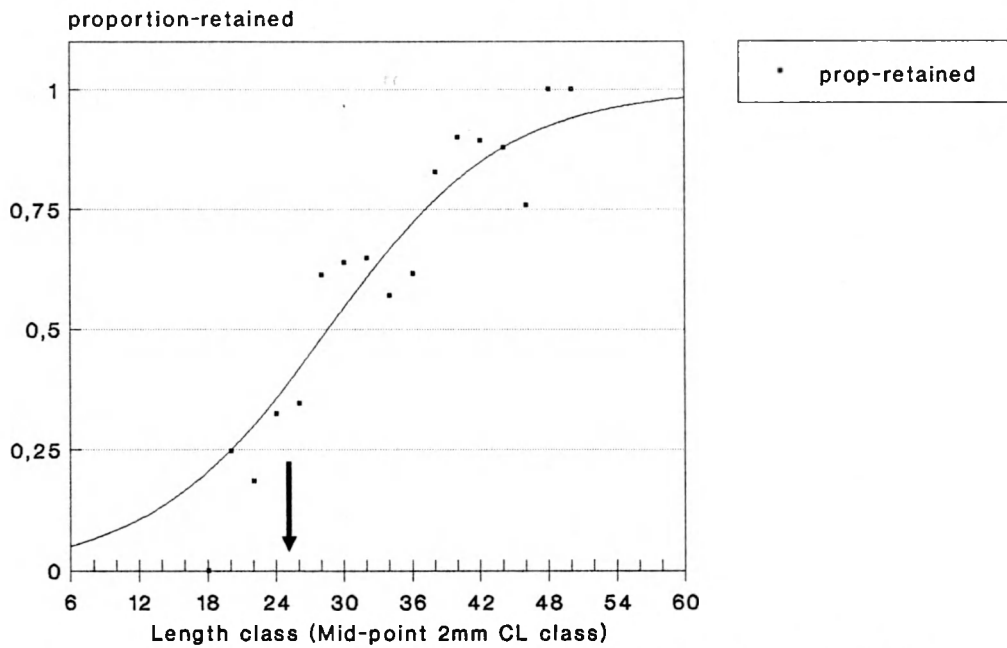


Figure 5.1.1.12

Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 15

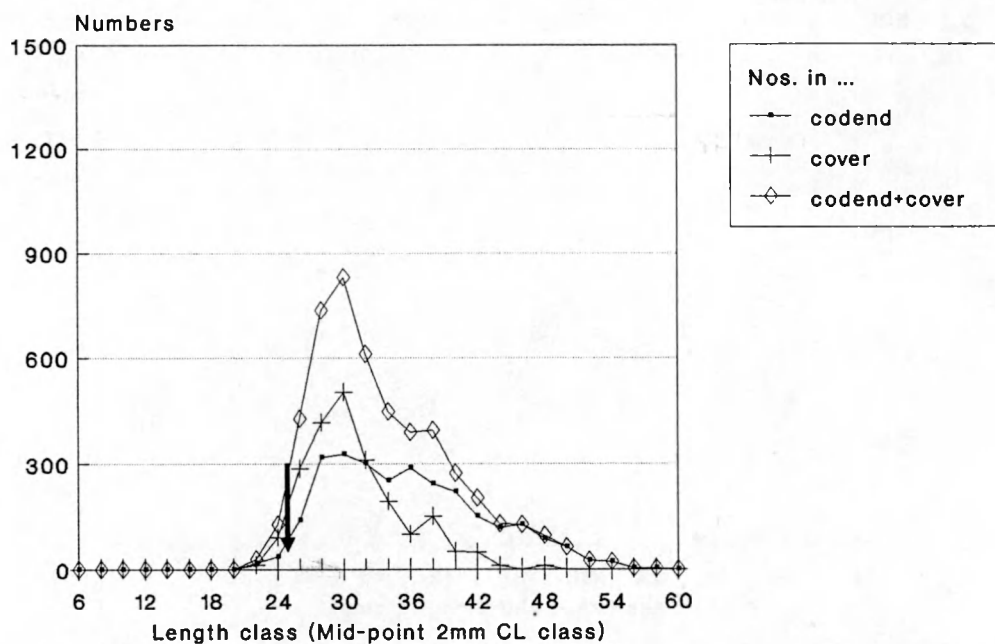


Figure 5.1.1.13 Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 1 : Haul 15

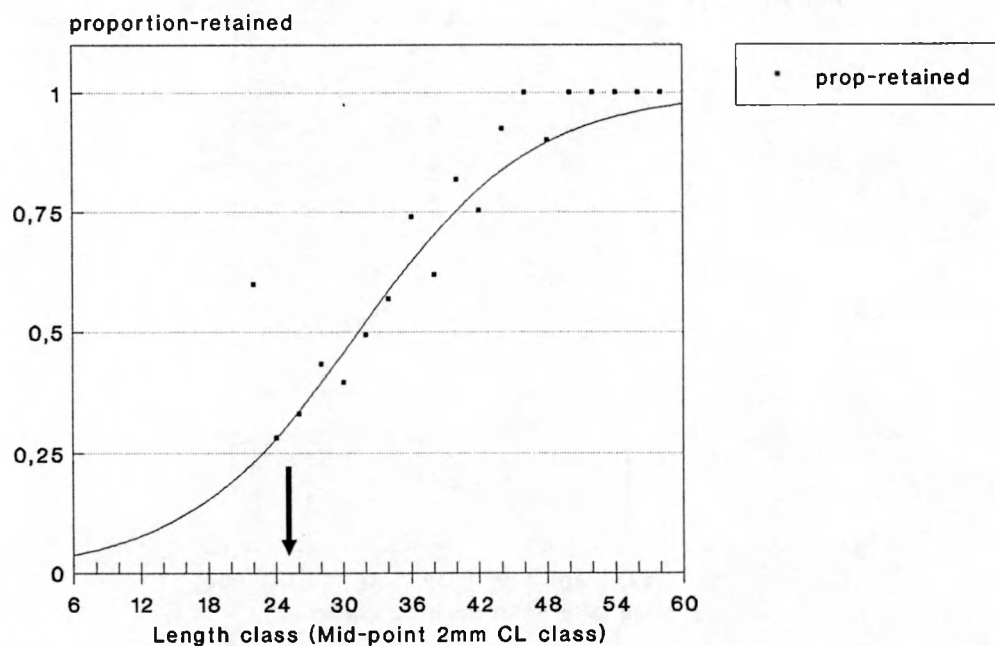
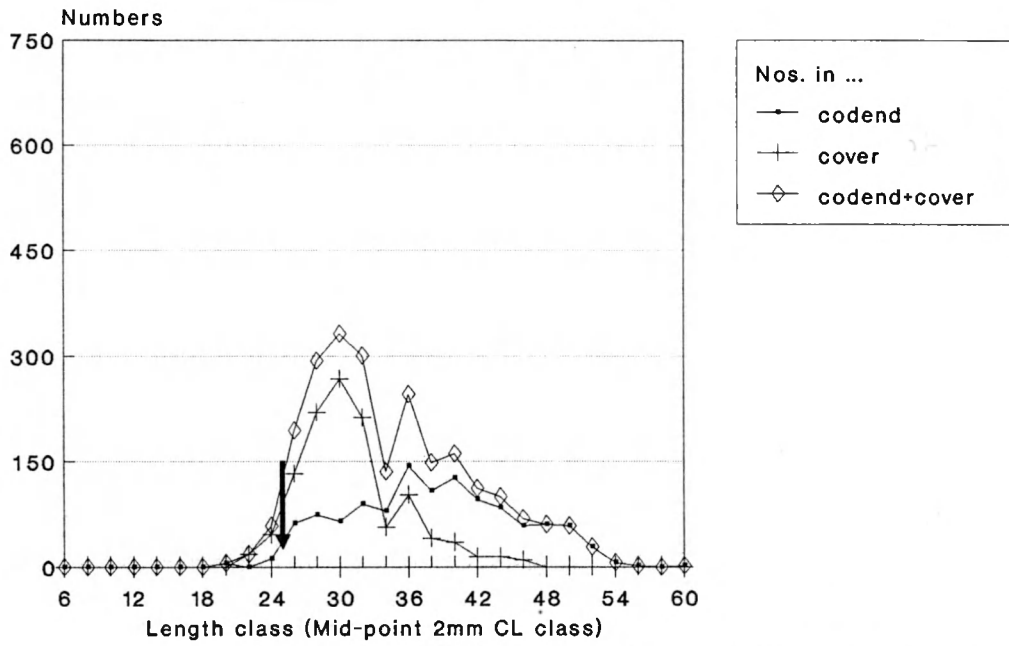


Figure 5.1.1.14 Arrow indicates minimum landing size

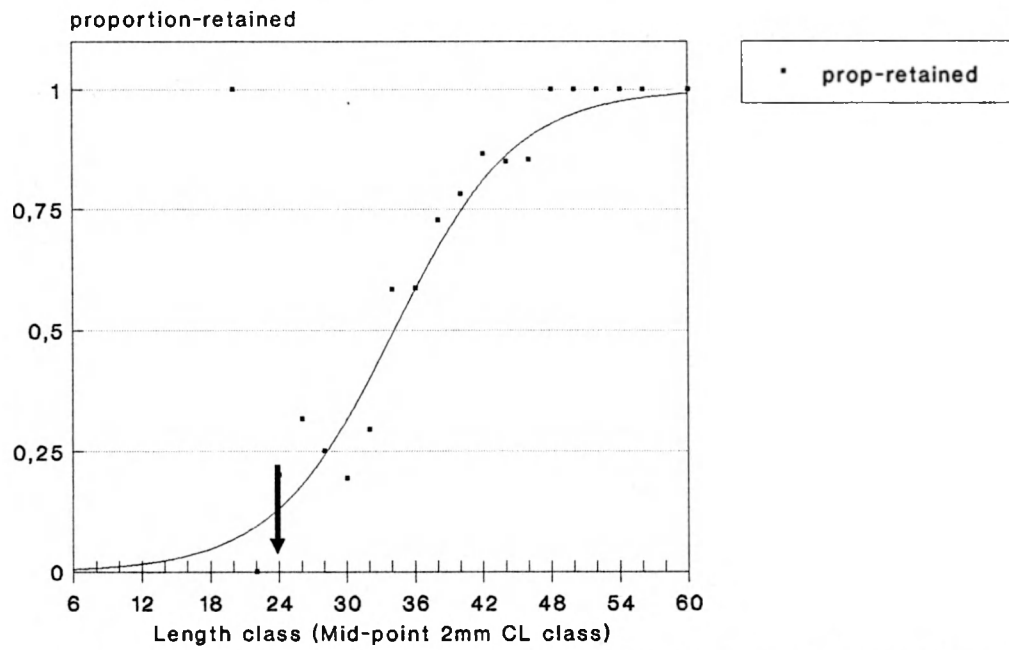
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 18



Arrow indicates minimum landing size

Figure 5.1.1.15

Nephrops selectivity study
 Campaign 1 : Haul 18



Arrow indicates minimum landing size

Figure 5.1.1.16

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 19

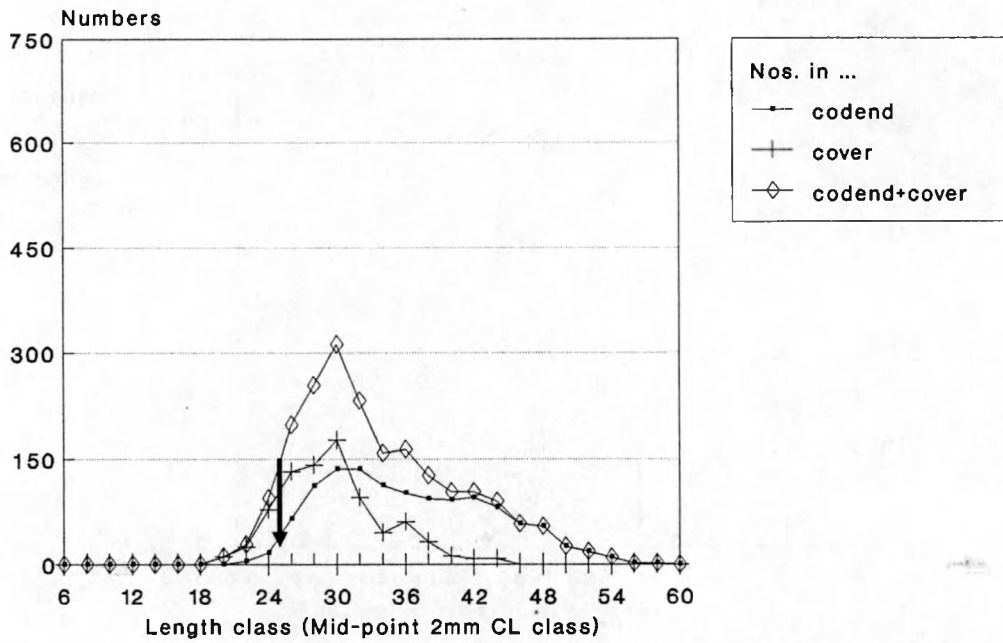


Figure 5.1.1.17

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 1 : Haul 19

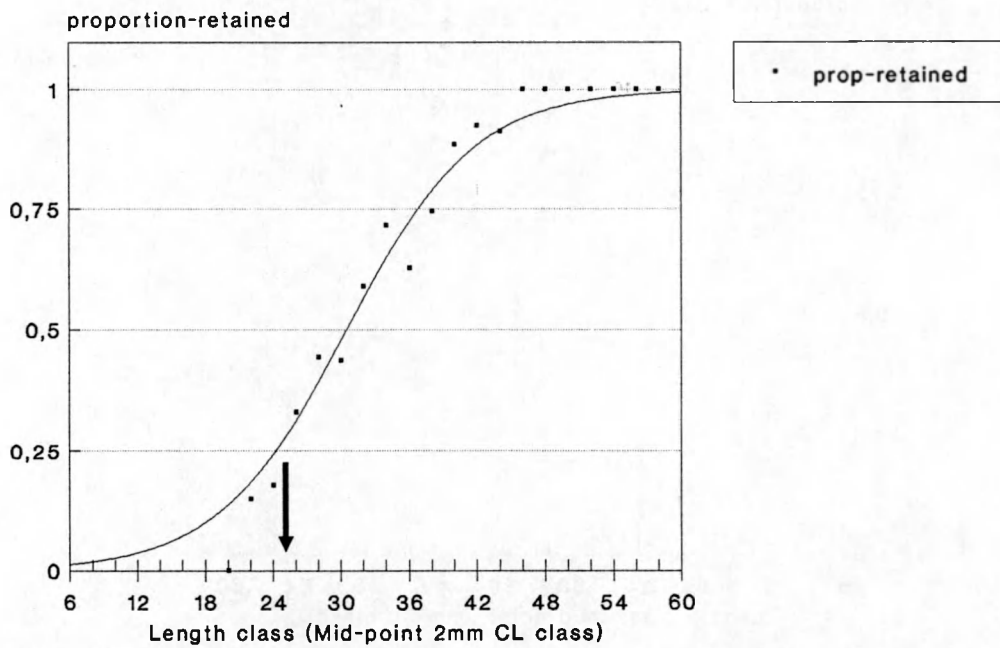


Figure 5.1.1.18

Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 20

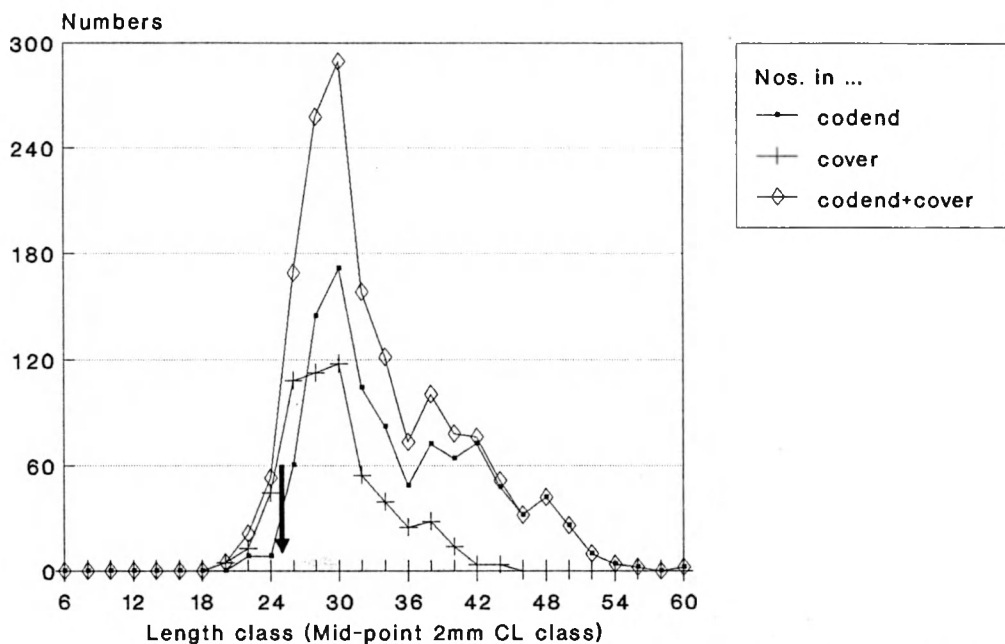


Figure 5.1.1.19 Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 1 : Haul 20

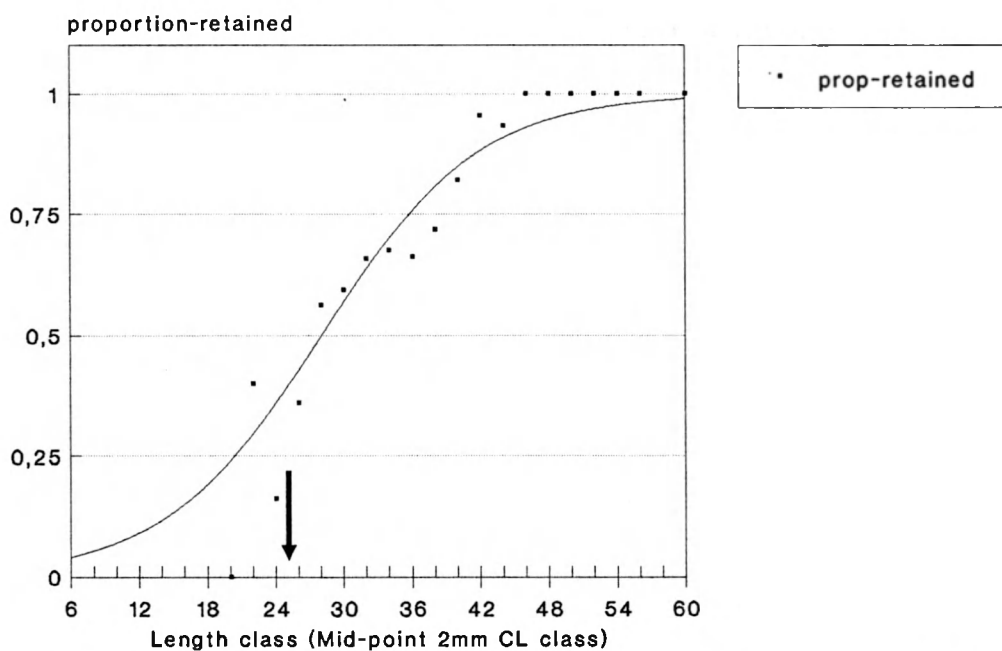
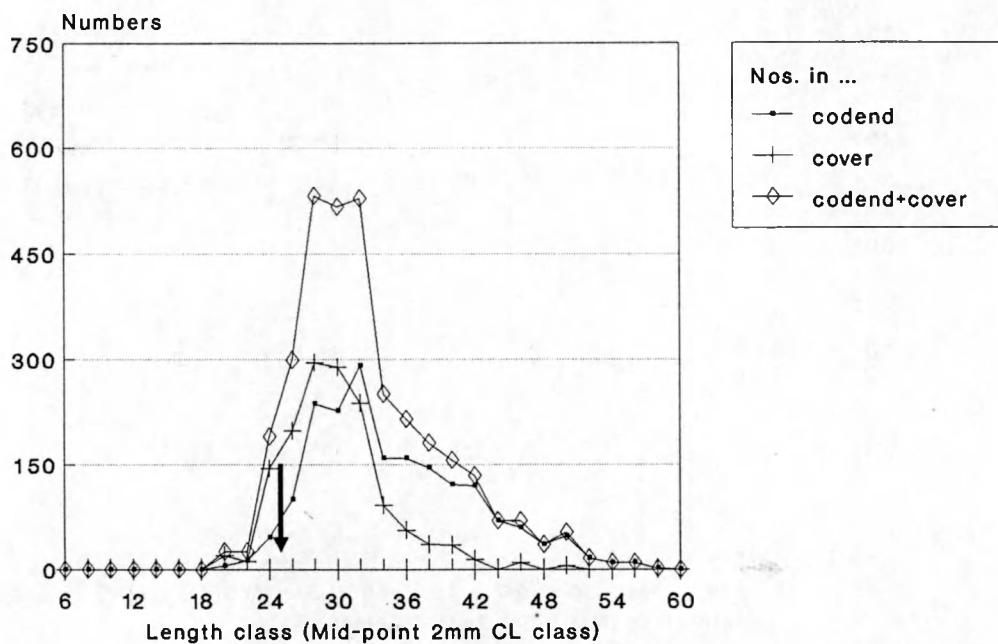


Figure 5.1.1.20 Arrow indicates minimum landing size

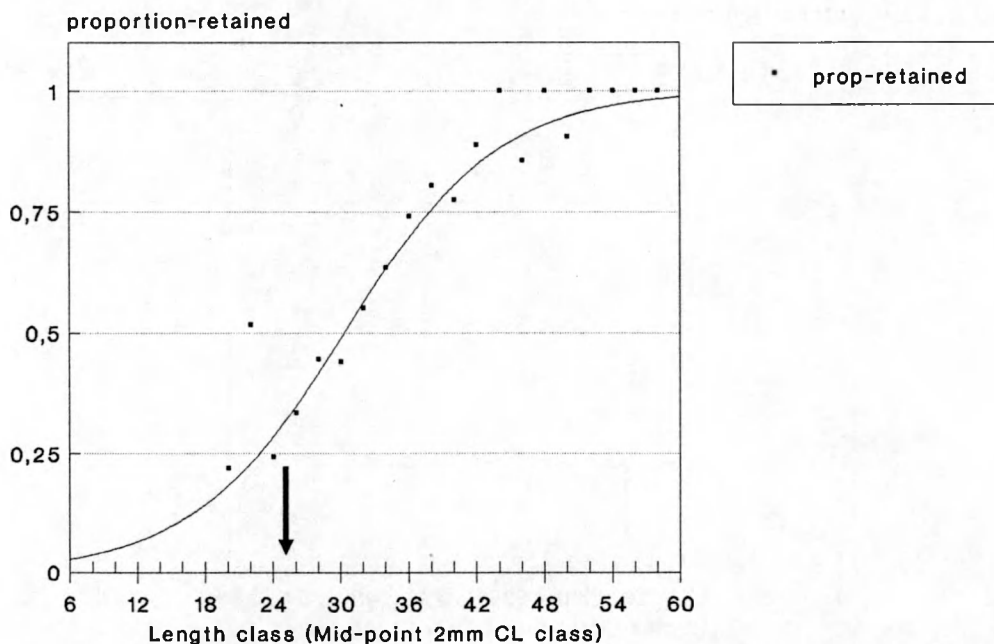
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 23



Arrow indicates minimum landing size

Figure 5.1.1.21

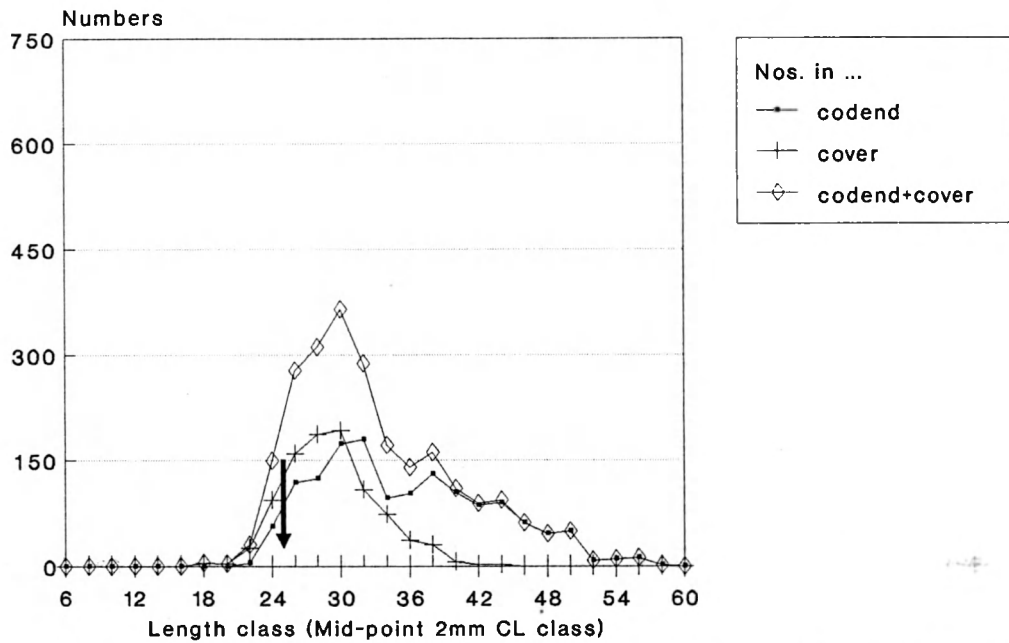
Nephrops selectivity study
 Campaign 1 : Haul 23



Arrow indicates minimum landing size

Figure 5.1.1.22

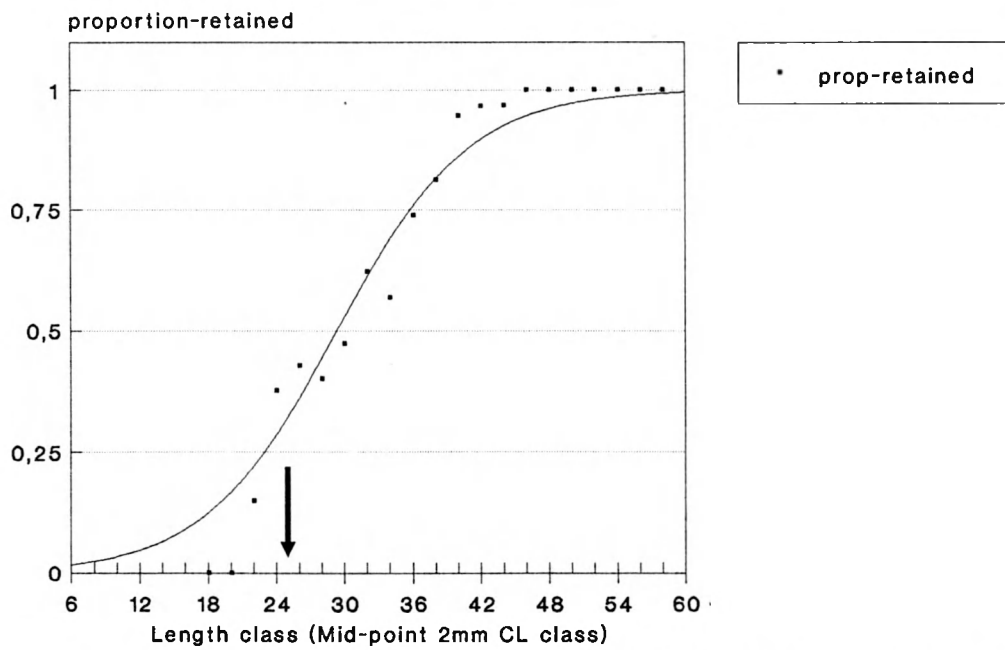
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 24



Arrow indicates minimum landing size

Figure 5.1.1.23

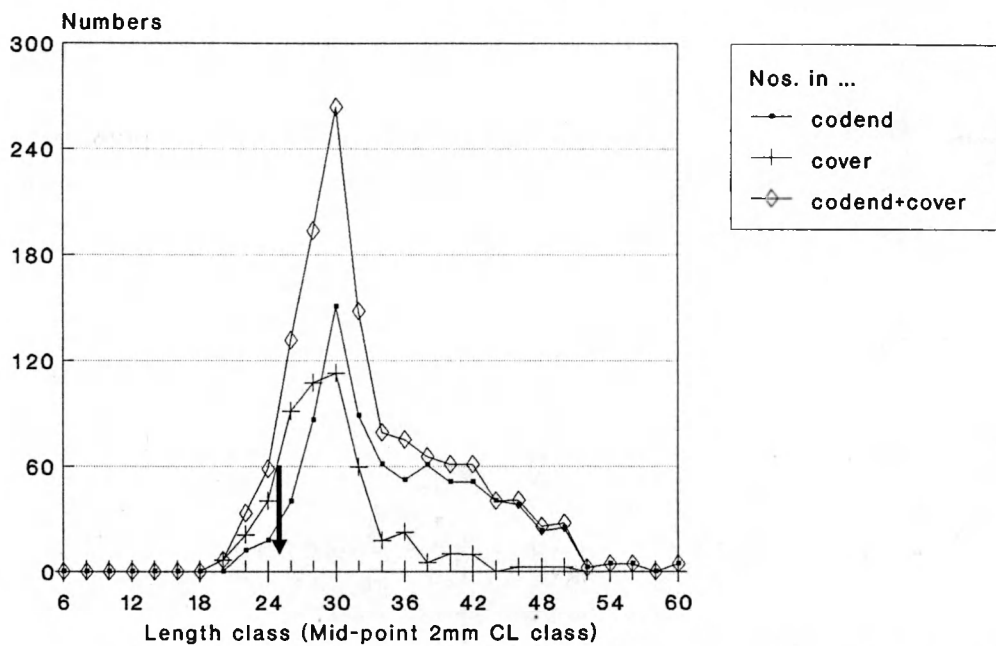
Nephrops selectivity study
 Campaign 1 : Haul 24



Arrow indicates minimum landing size

Figure 5.1.1.24

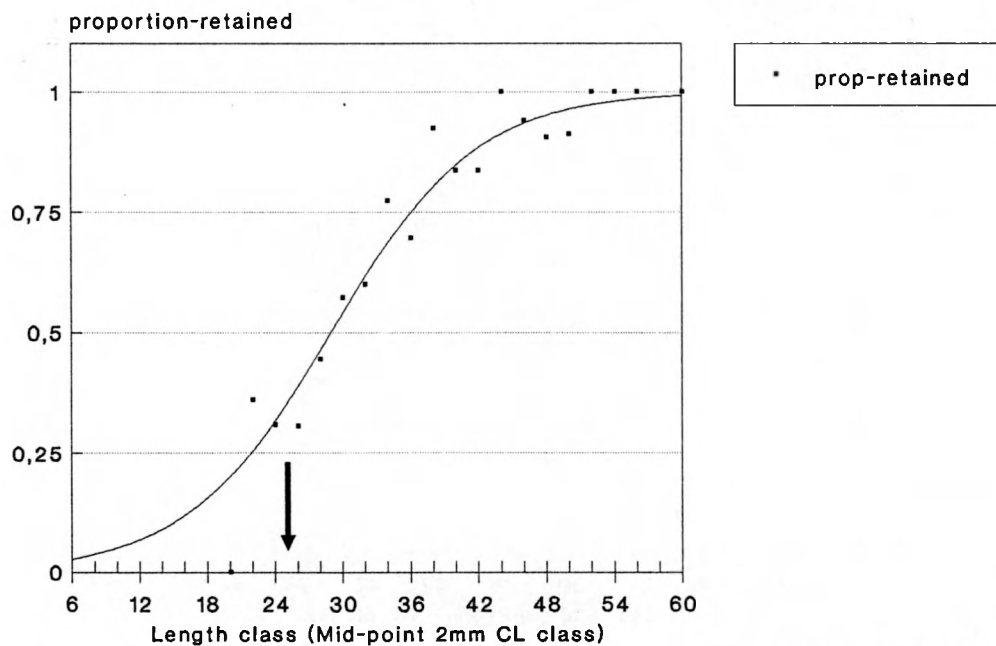
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 25



Arrow indicates minimum landing size

Figure 5.1.1.25

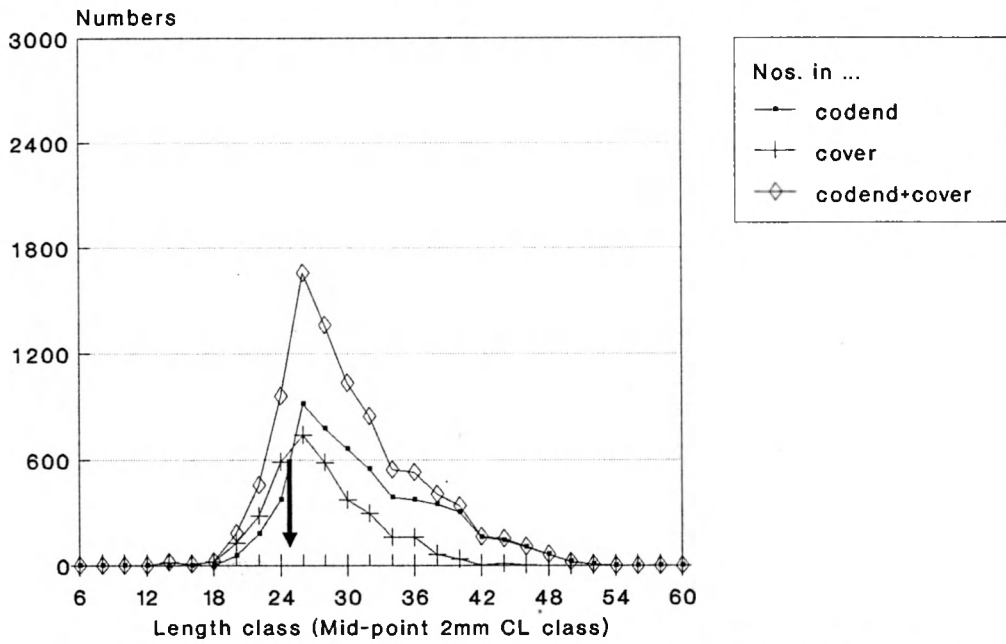
Nephrops selectivity study
 Campaign 1 : Haul 25



Arrow indicates minimum landing size

Figure 5.1.1.26

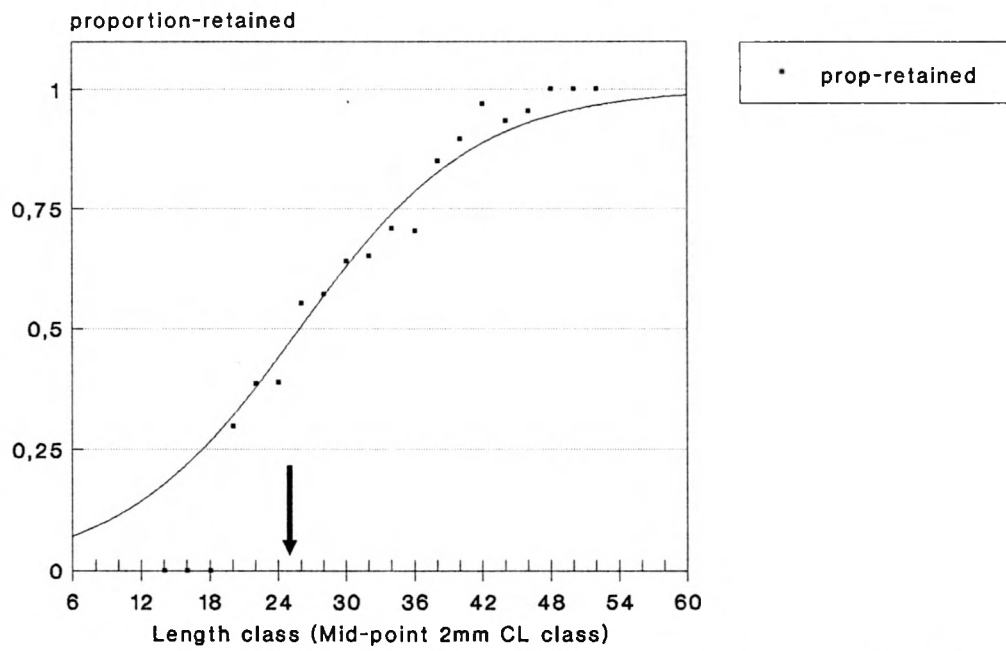
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 29



Arrow indicates minimum landing size

Figure 5.1.1.27

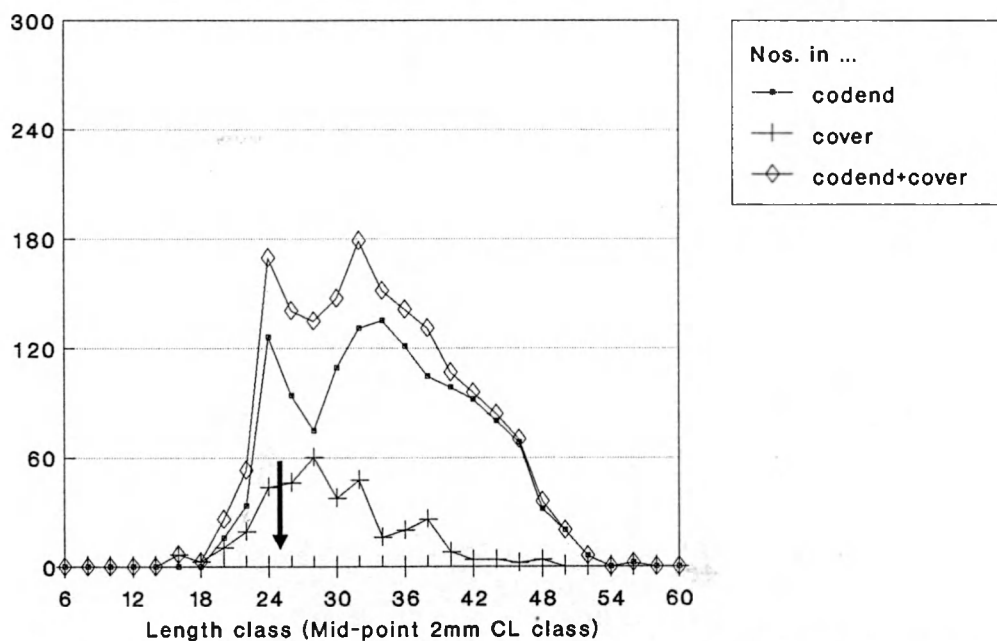
Nephrops selectivity study
 Campaign 1 : Haul 29



Arrow indicates minimum landing size

Figure 5.1.1.28

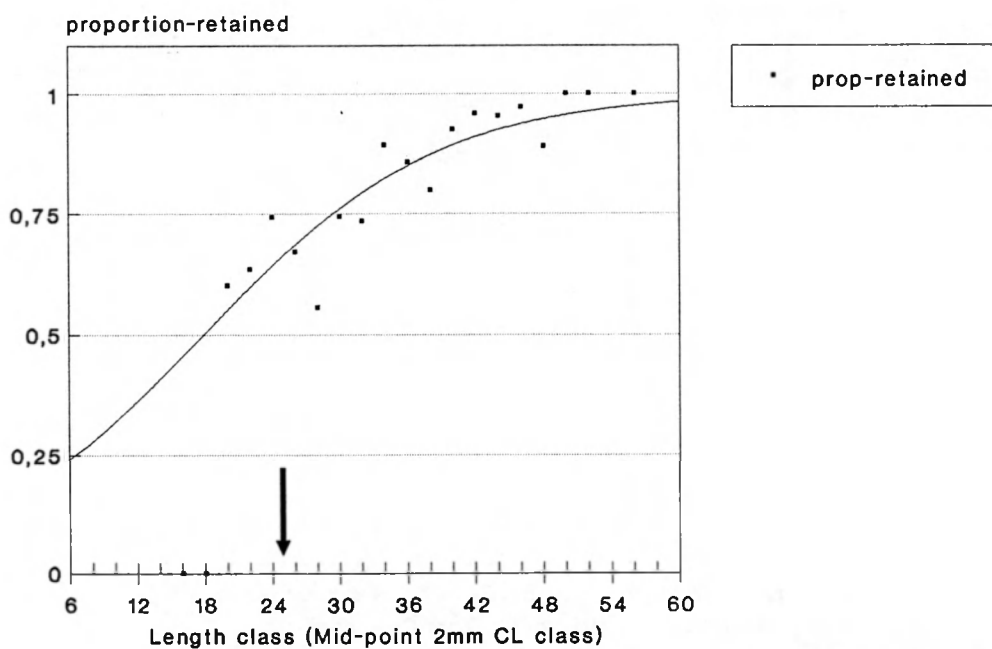
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 31



Arrow indicates minimum landing size

Figure 5.1.1.29

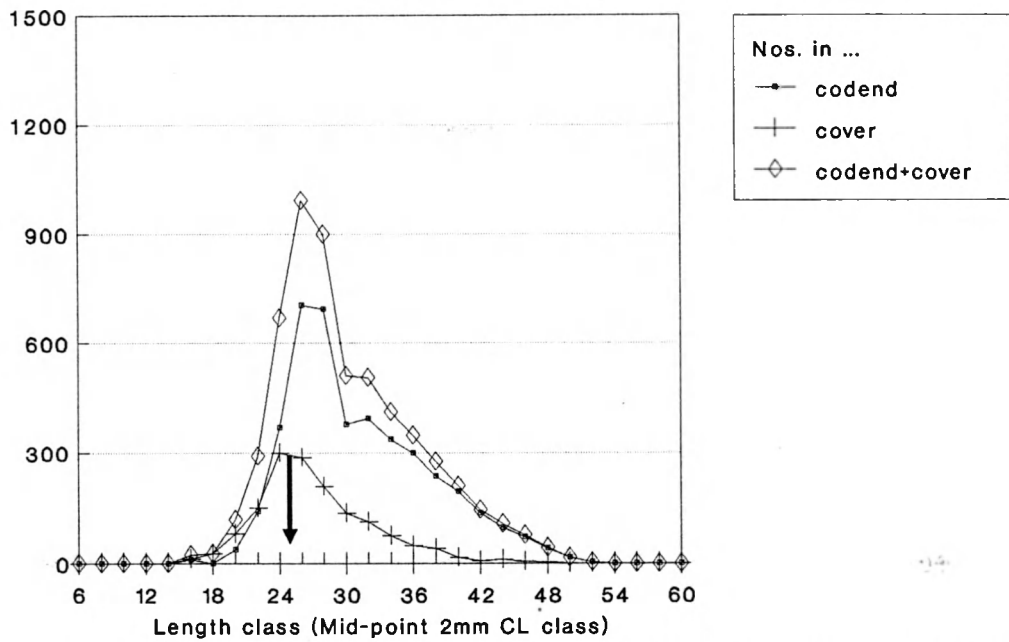
Nephrops selectivity study
 Campaign 1 : Haul 31



Arrow indicates minimum landing size

Figure 5.1.1.30

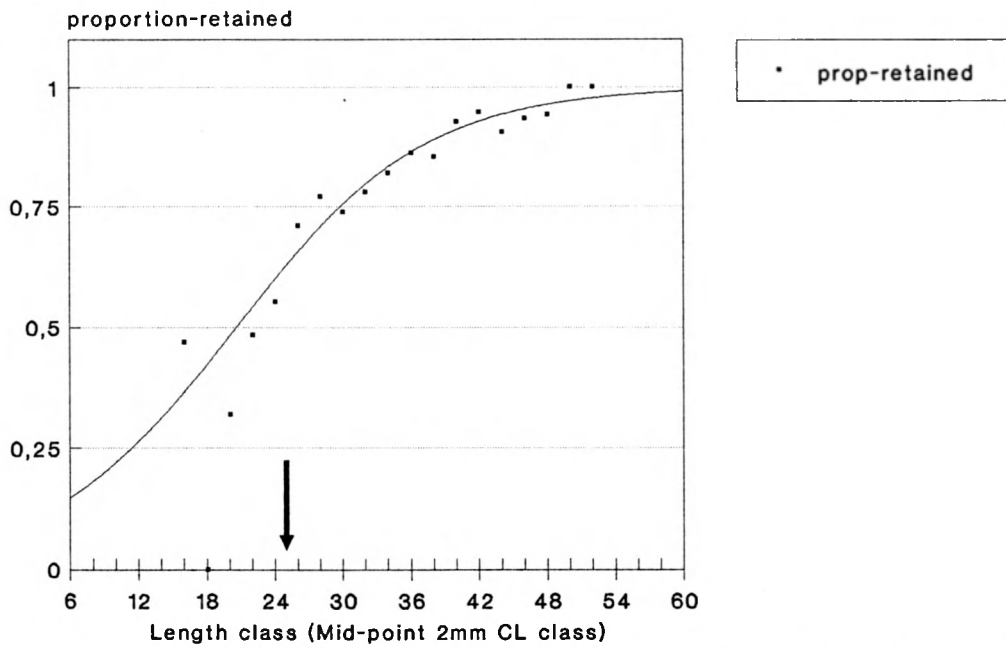
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 32



Arrow indicates minimum landing size

Figure 5.1.1.31

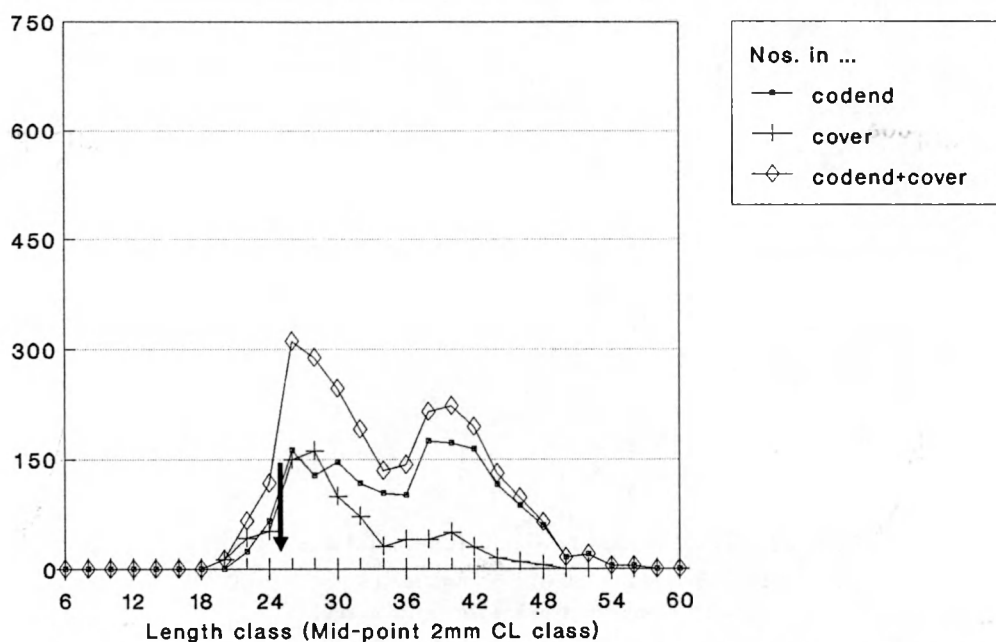
Nephrops selectivity study
 Campaign 1 : Haul 32



Arrow indicates minimum landing size

Figure 5.1.1.32

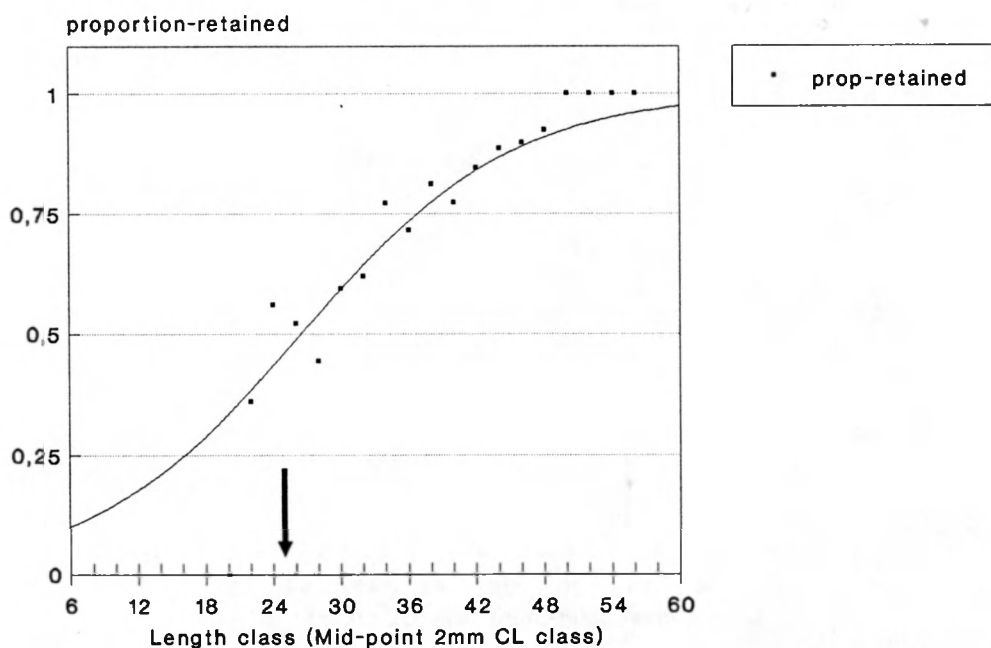
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 39



Arrow indicates minimum landing size

Figure 5.1.1.33

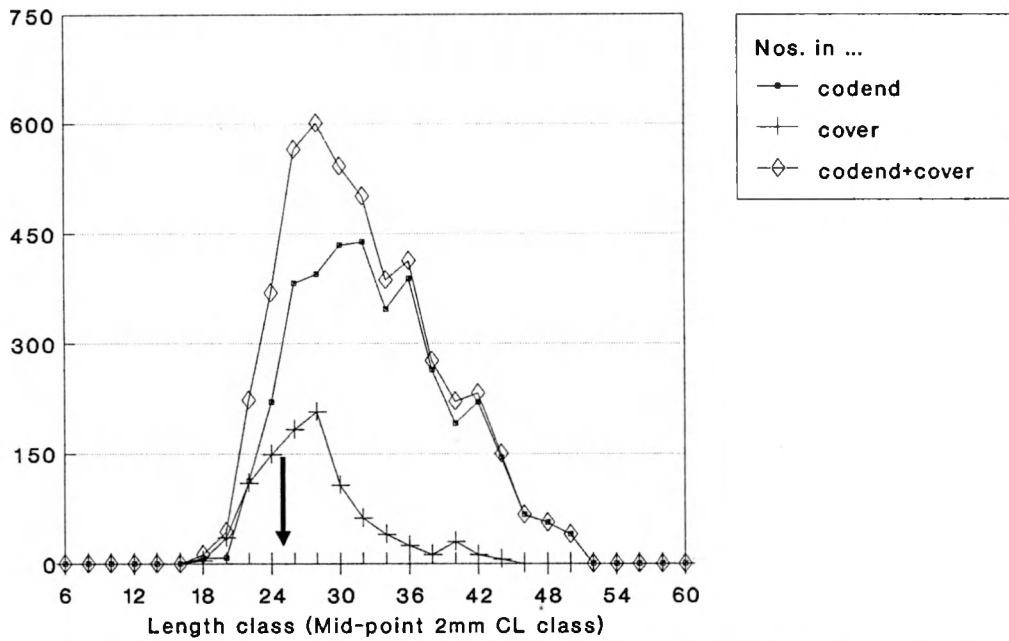
Nephrops selectivity study
 Campaign 1 : Haul 39



Arrow indicates minimum landing size

Figure 5.1.1.34

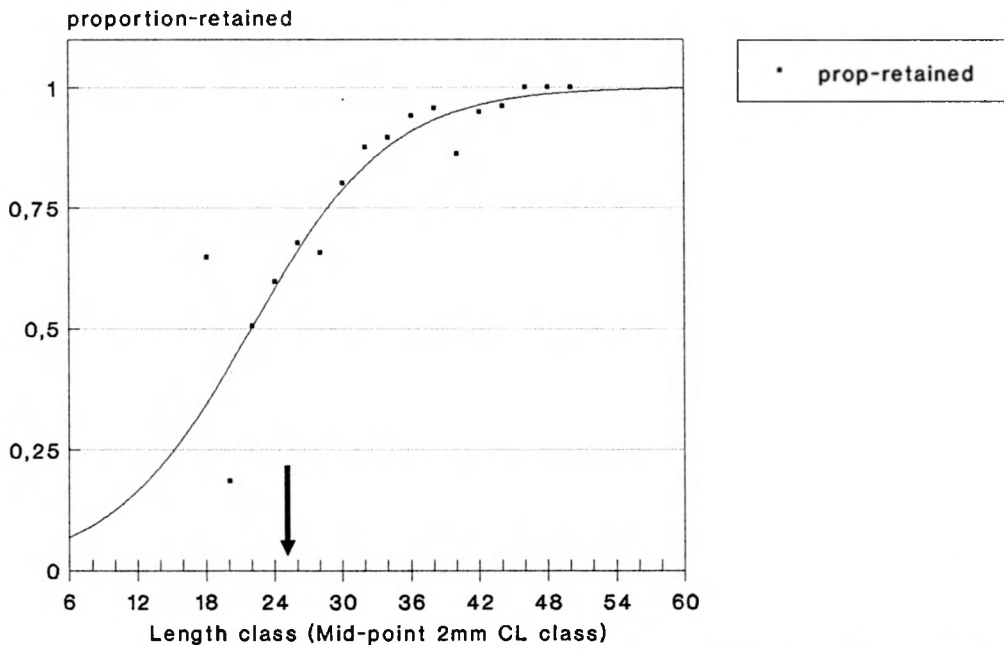
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 41



Arrow indicates minimum landing size

Figure 5.1.1.35

Nephrops selectivity study
 Campaign 1 : Haul 41



Arrow indicates minimum landing size

Figure 5.1.1.36

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 42

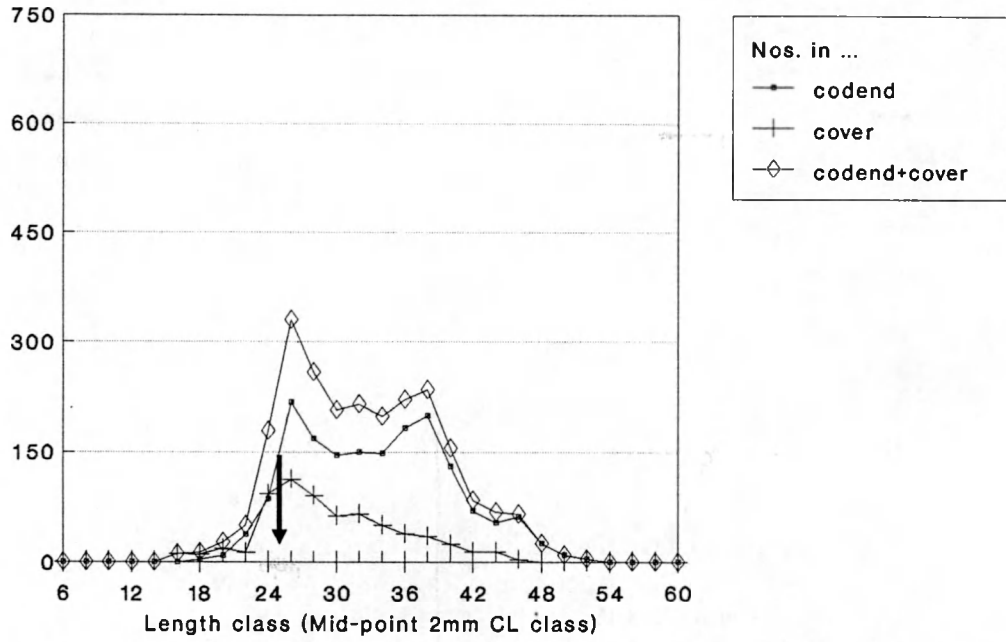


Figure 5.1.1.37 Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 1 : Haul 42

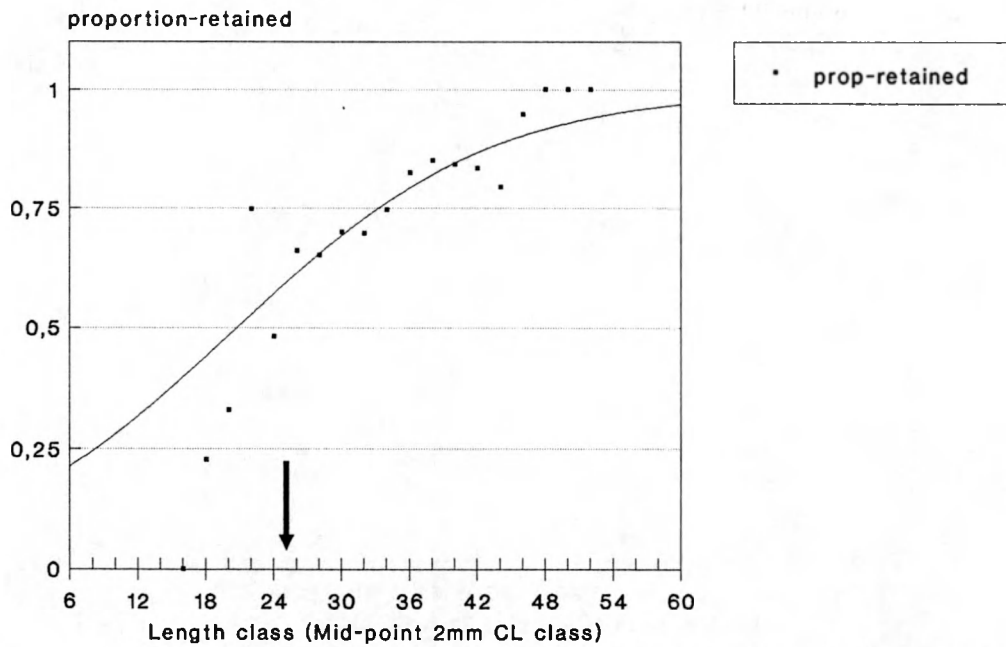


Figure 5.1.1.38 Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 43

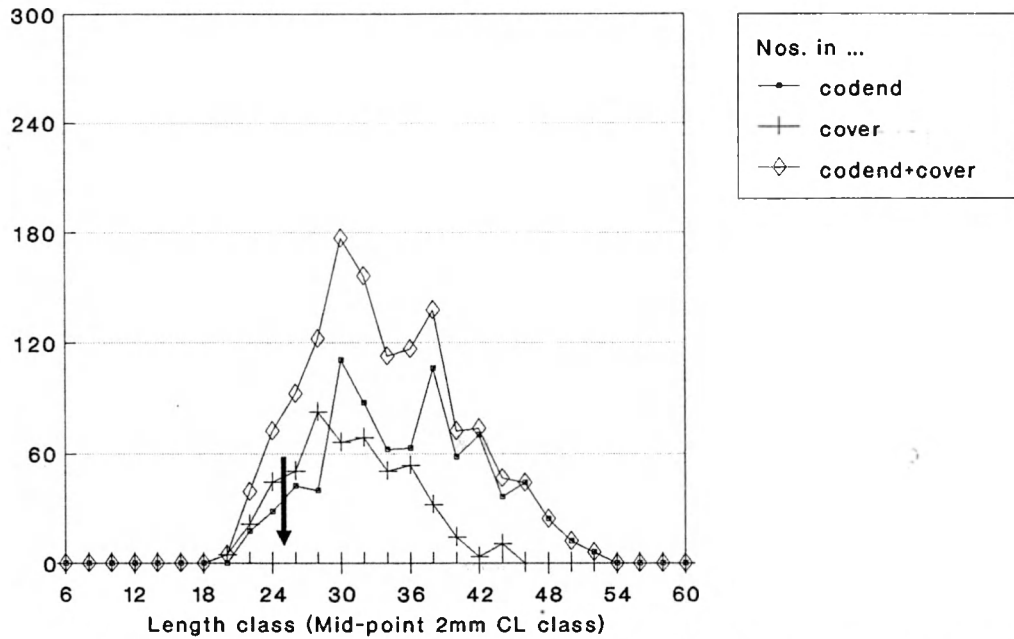


Figure 5.1.1.39

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 1 : Haul 43

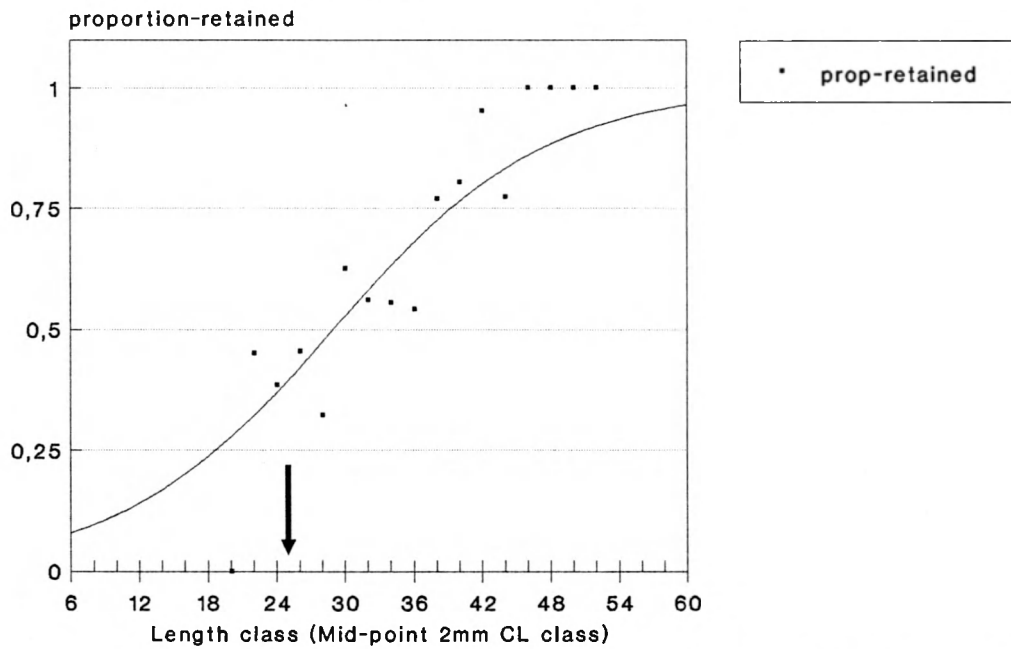
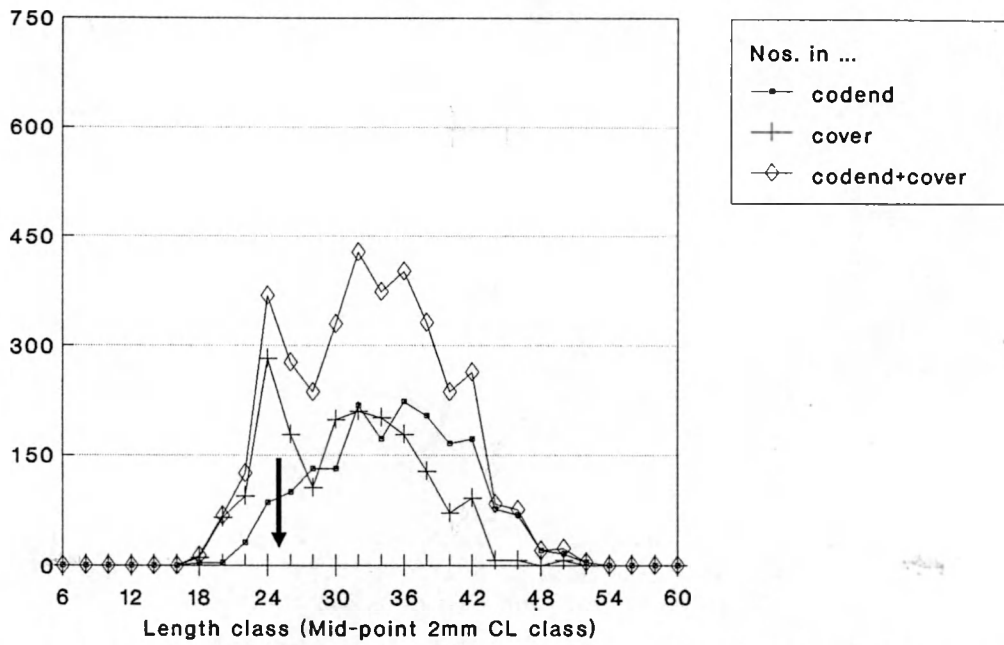


Figure 5.1.1.40

Arrow indicates minimum landing size

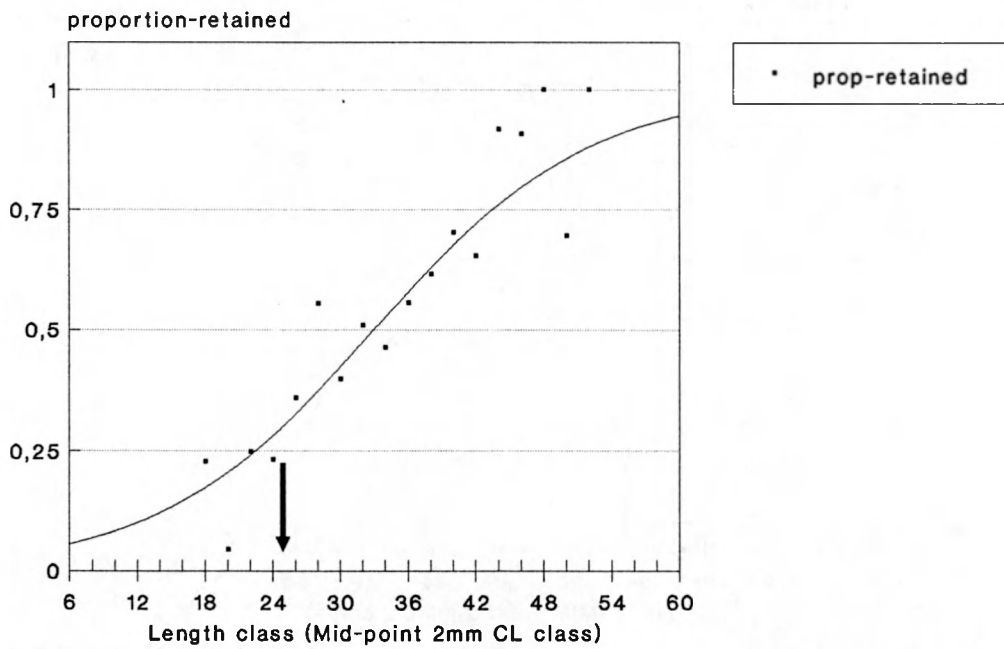
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 47



Arrow indicates minimum landing size

Figure 5.1.1.41

Nephrops selectivity study
 Campaign 1 : Haul 47



Arrow indicates minimum landing size

Figure 5.1.1.42

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 49

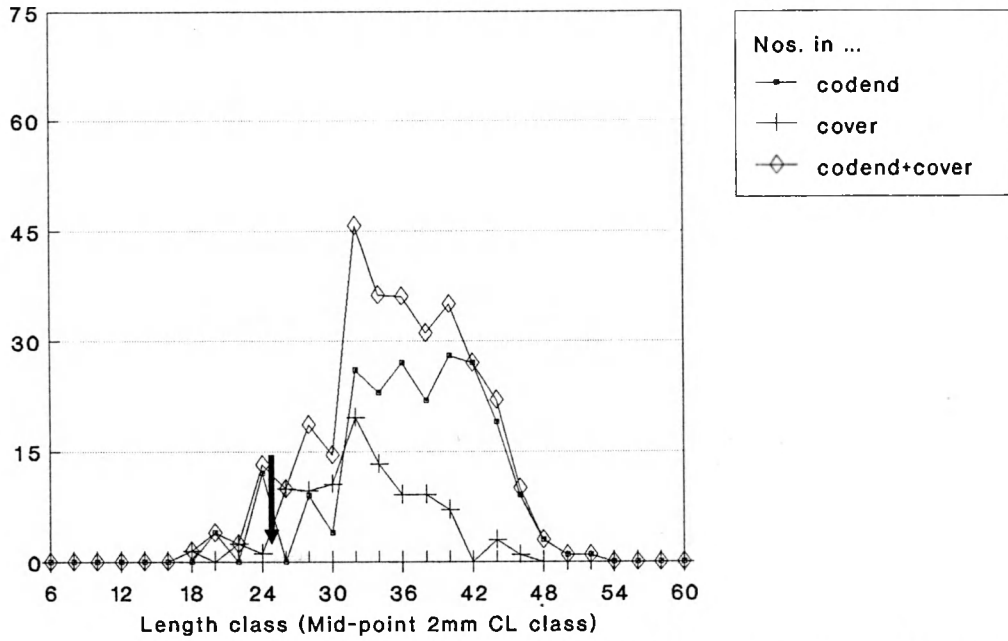


Figure 5.1.1.43 Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 1 : Haul 49

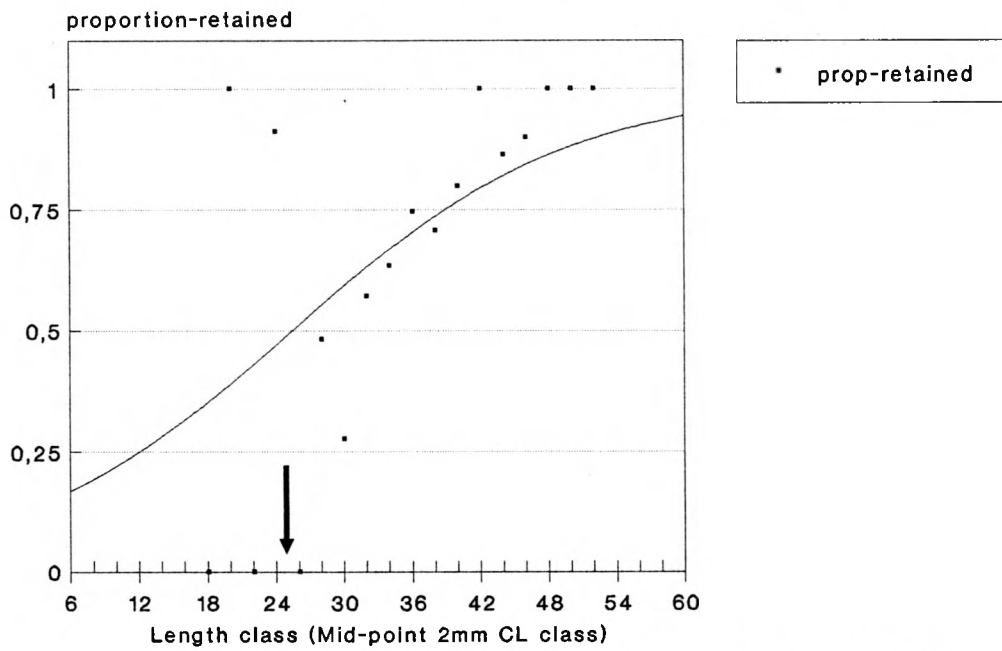
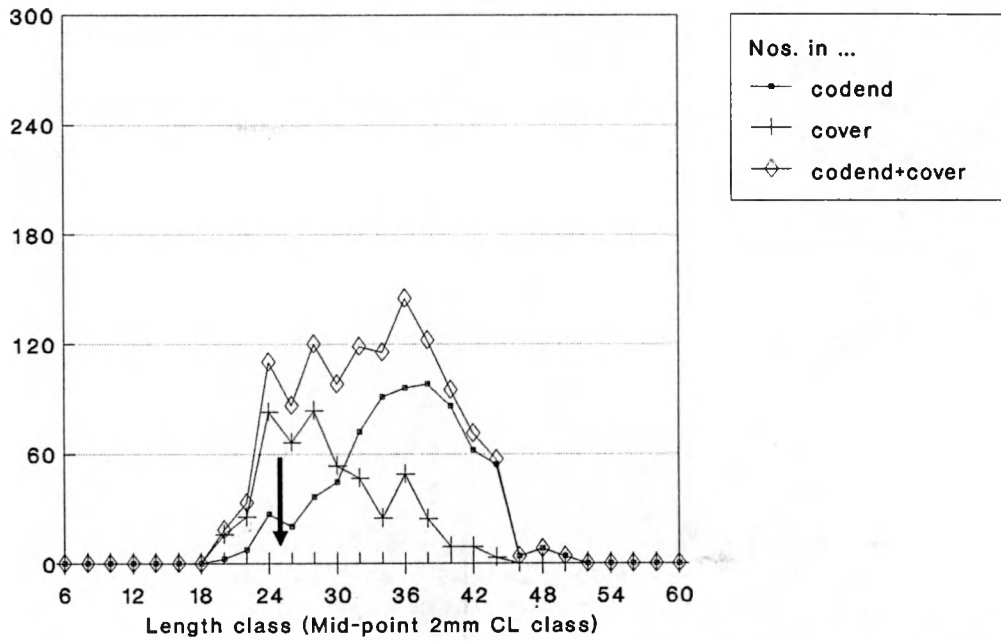


Figure 5.1.1.44 Arrow indicates minimum landing size

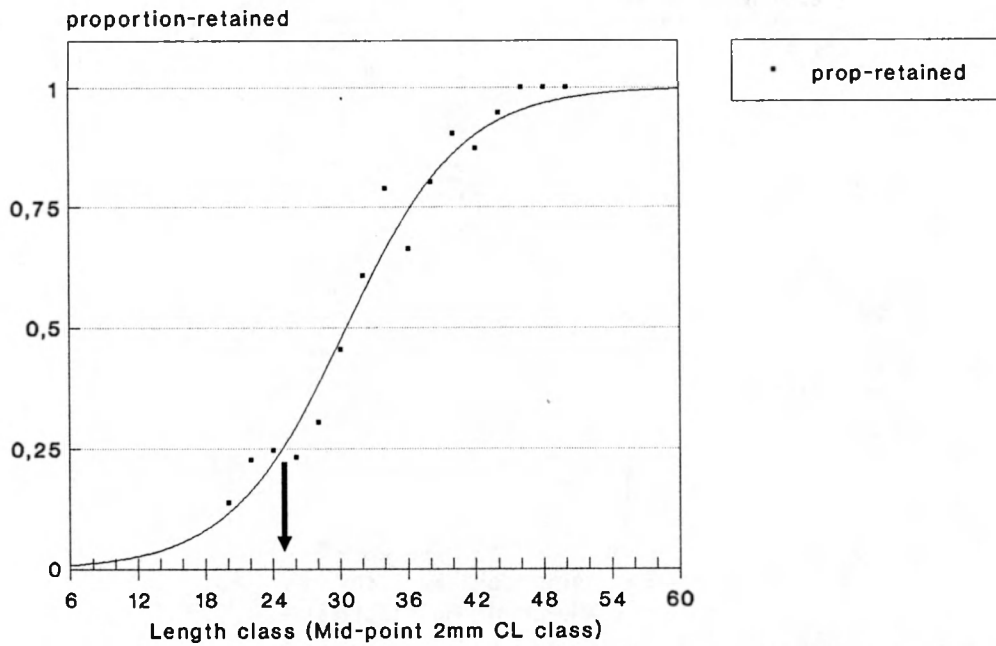
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 50



Arrow indicates minimum landing size

Figure 5.1.1.45

Nephrops selectivity study
 Campaign 1 : Haul 50



Arrow indicates minimum landing size

Figure 5.1.1.46

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 51

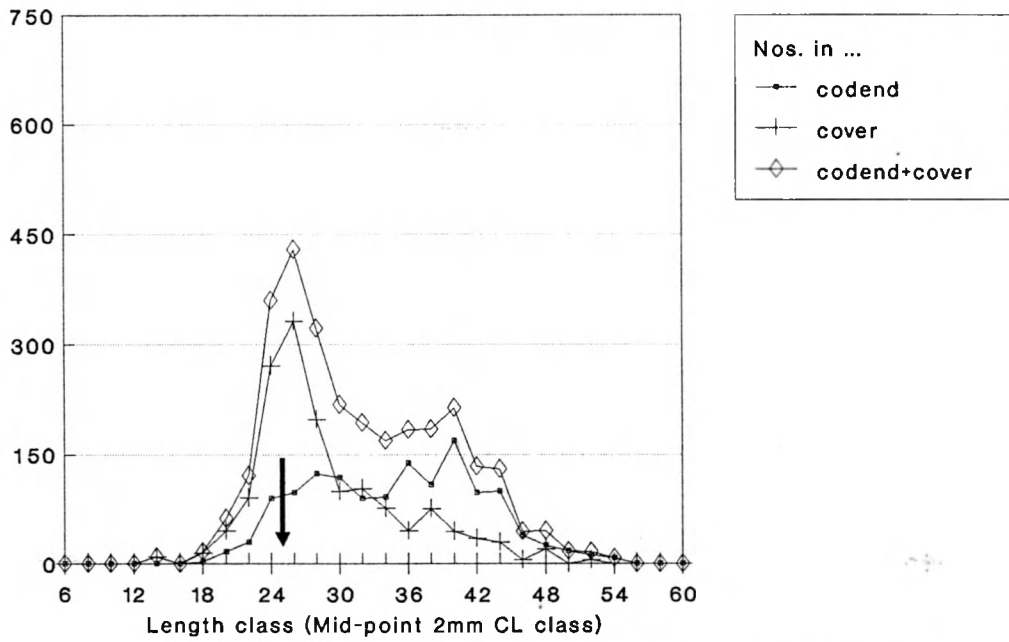


Figure 5.1.1.47 Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 1 : Haul 51

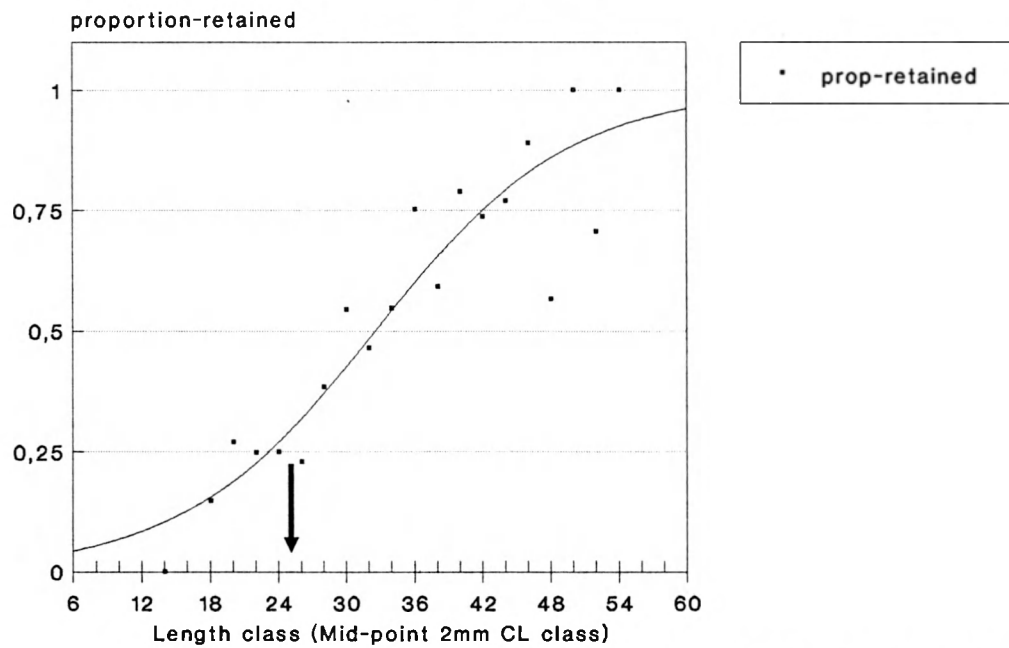


Figure 5.1.1.48 Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 1 : Haul 52

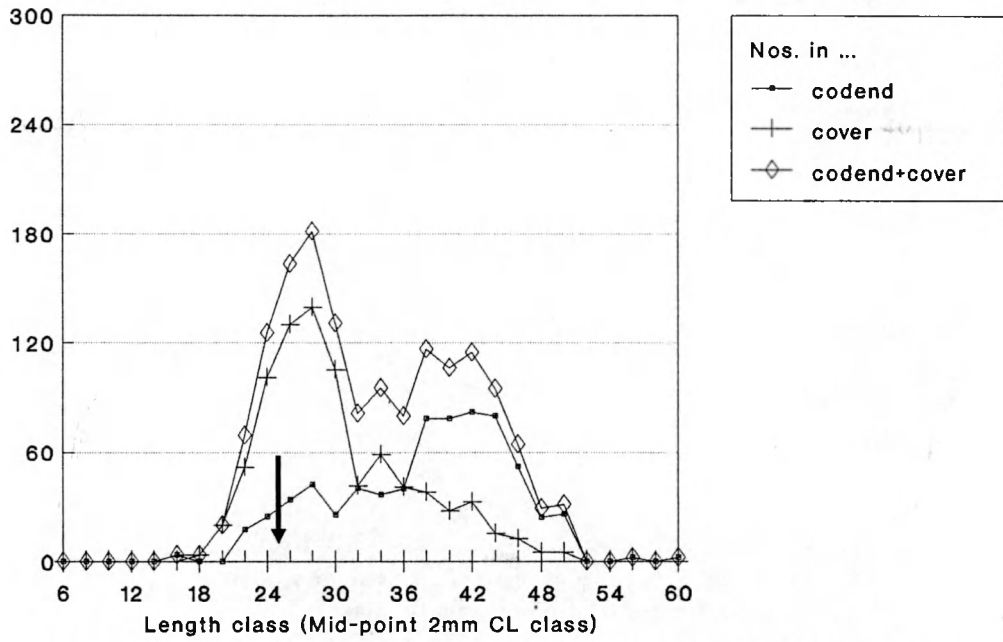


Figure 5.1.1.49 Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 1 : Haul 52

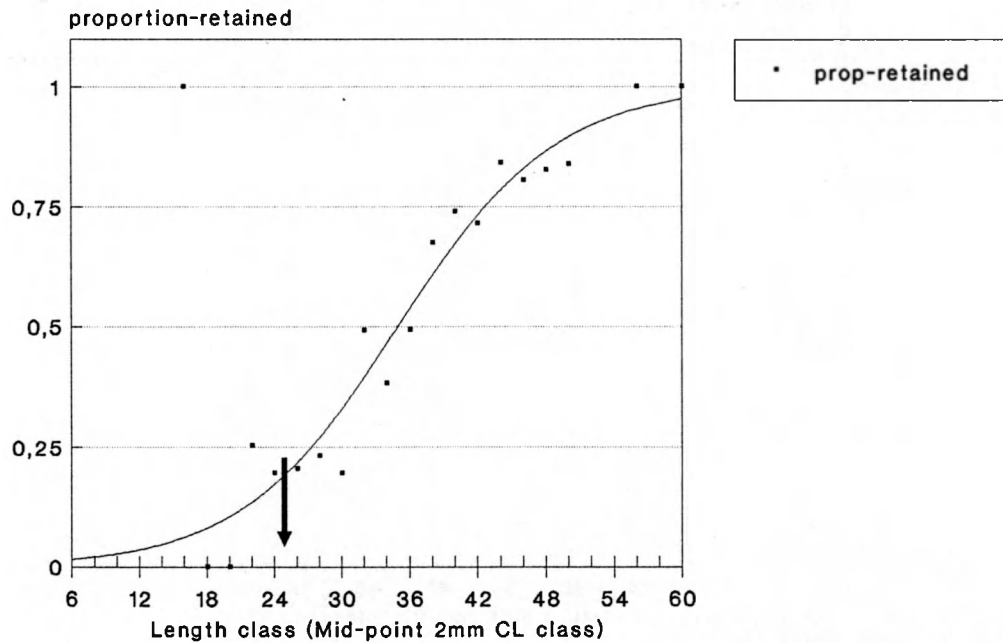
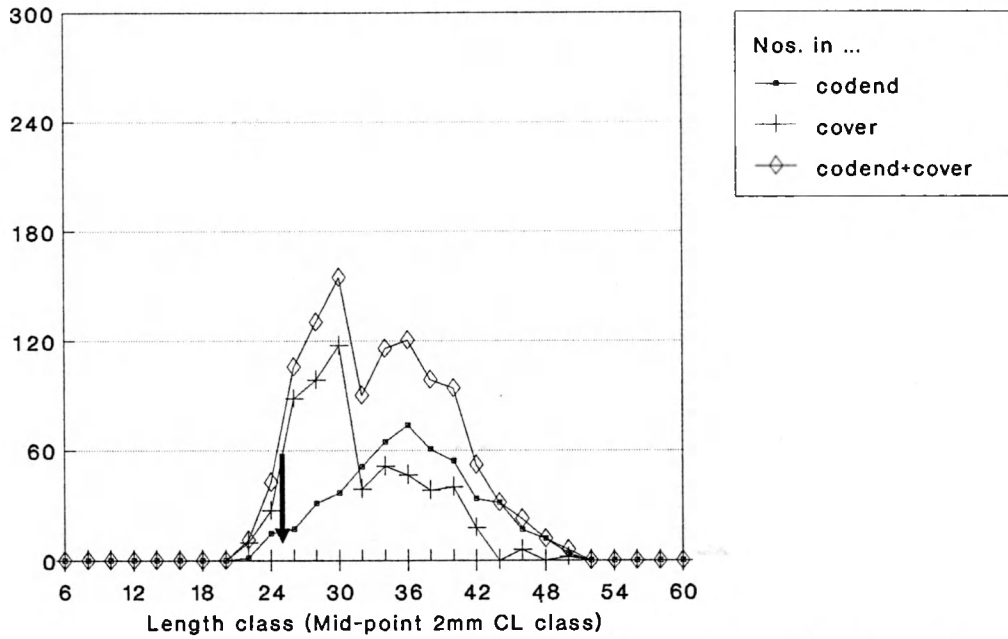


Figure 5.1.1.50 Arrow indicates minimum landing size

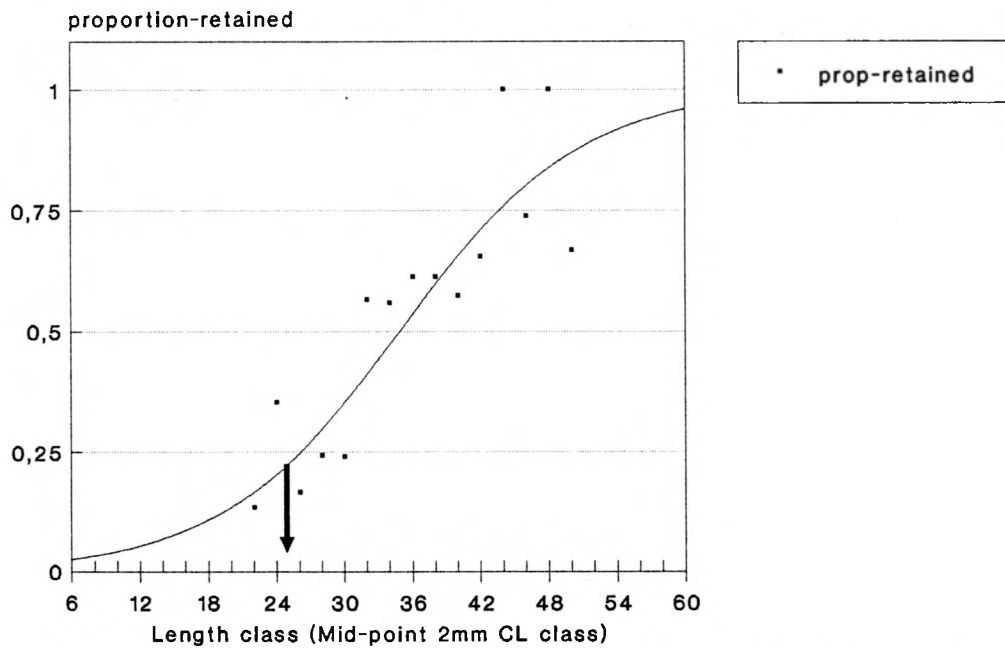
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 27



Arrow indicates minimum landing size

Figure 5.1.1.51

Nephrops selectivity study
 Campaign 2 : Haul 25



Arrow indicates minimum landing size

Figure 5.1.1.52

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 29

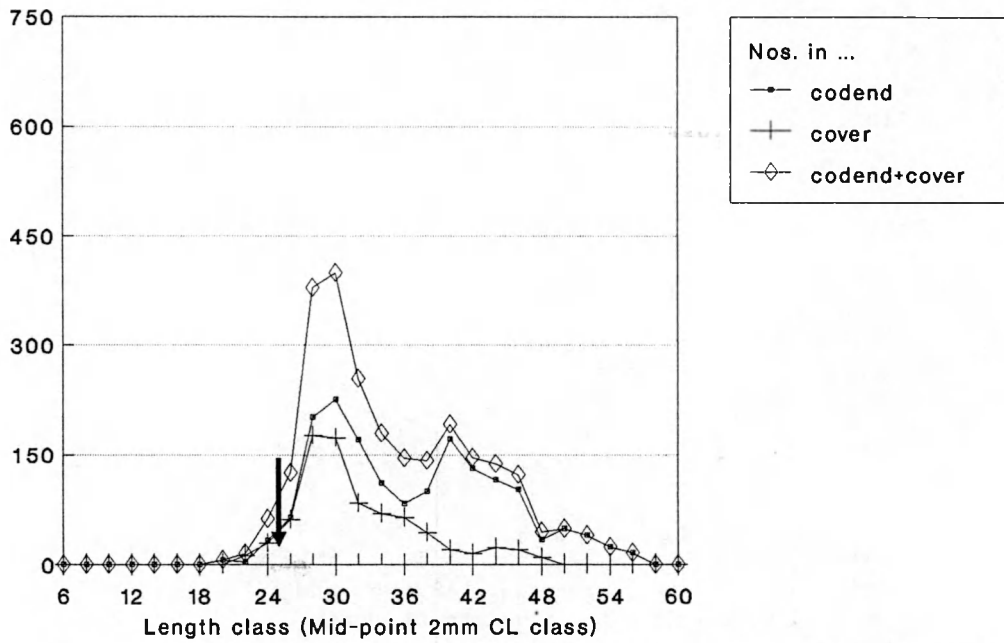


Figure 5.1.1.53

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 29

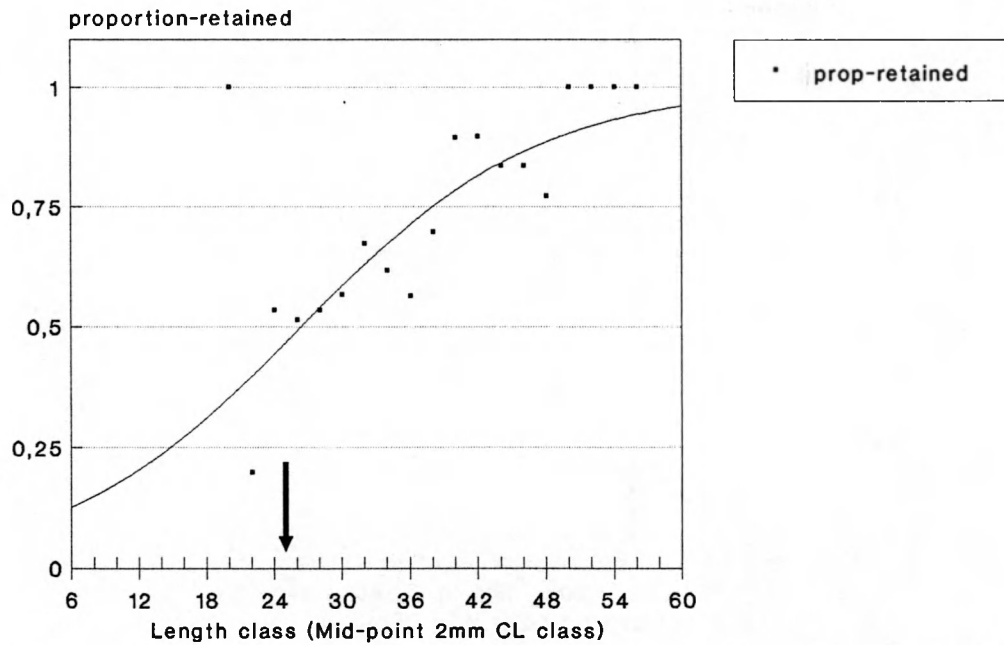


Figure 5.1.1.54

Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 30

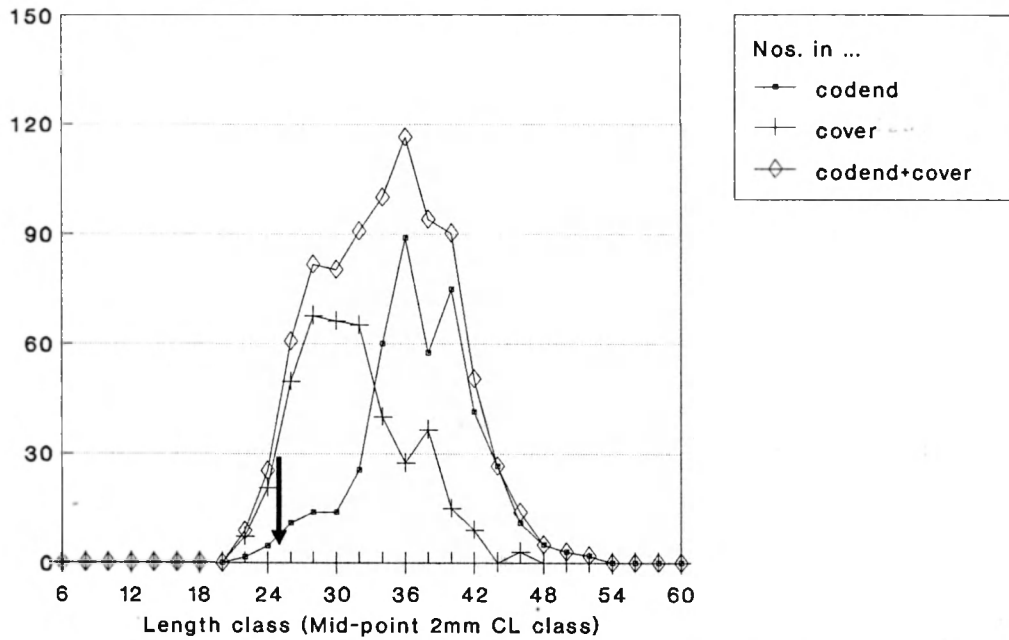


Figure 5.1.1.55

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 30

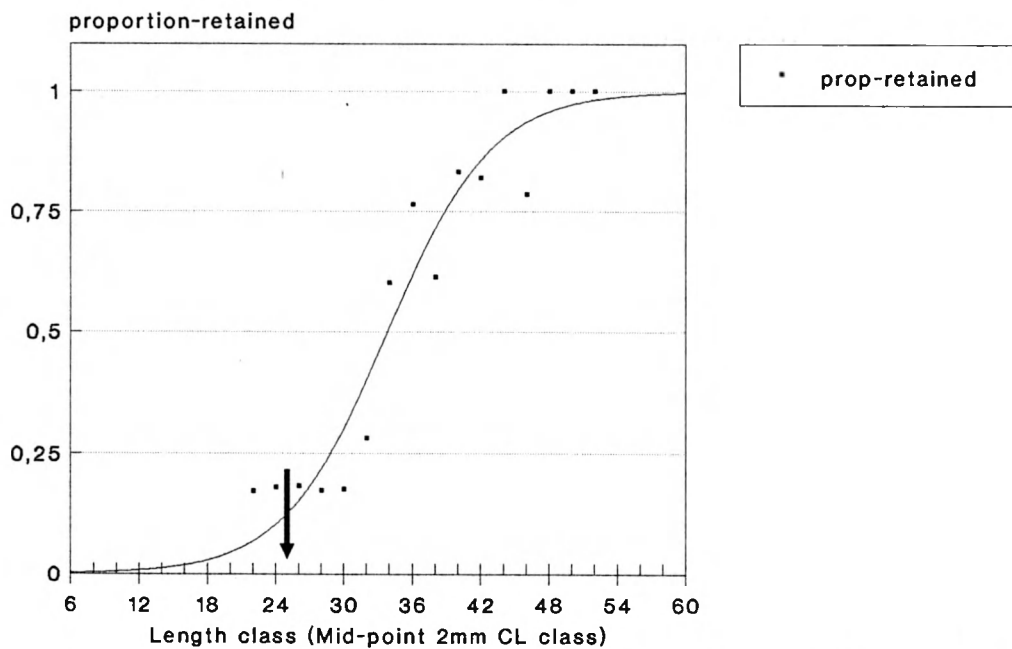


Figure 5.1.1.56

Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 32

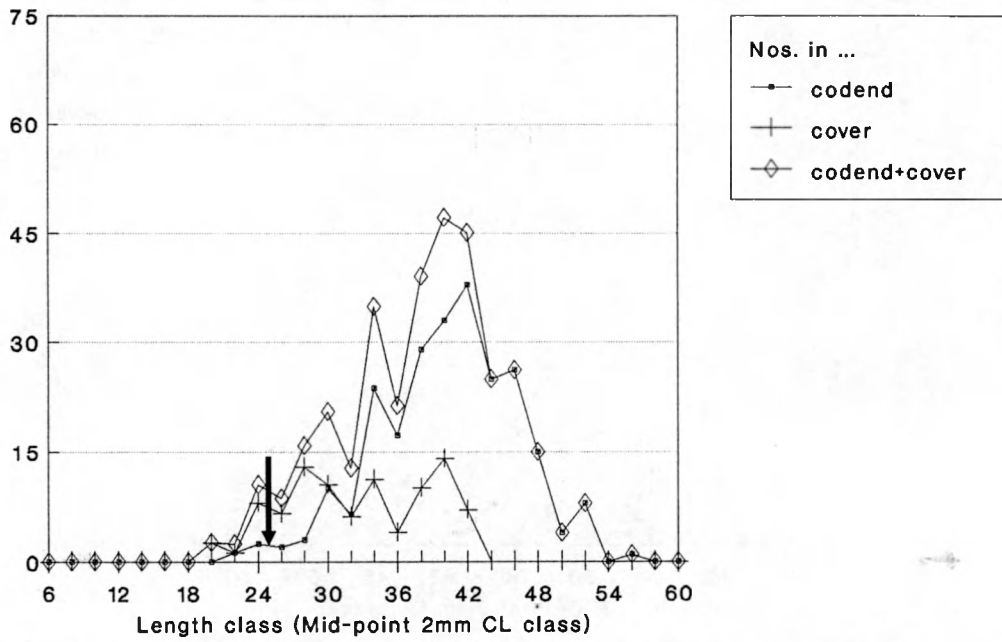


Figure 5.1.1.57

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 32

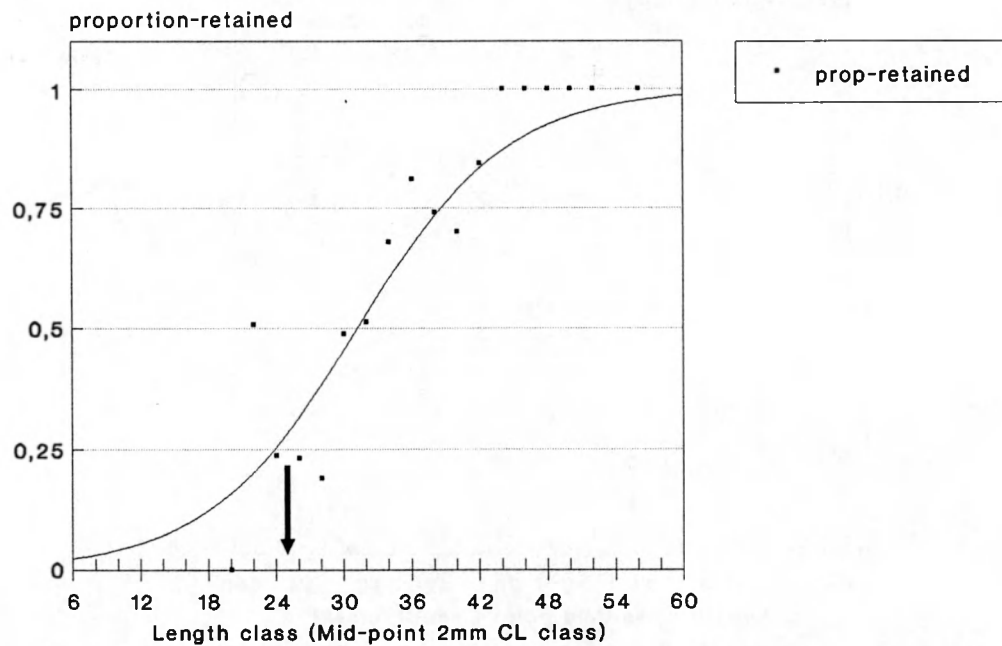


Figure 5.1.1.58

Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 35

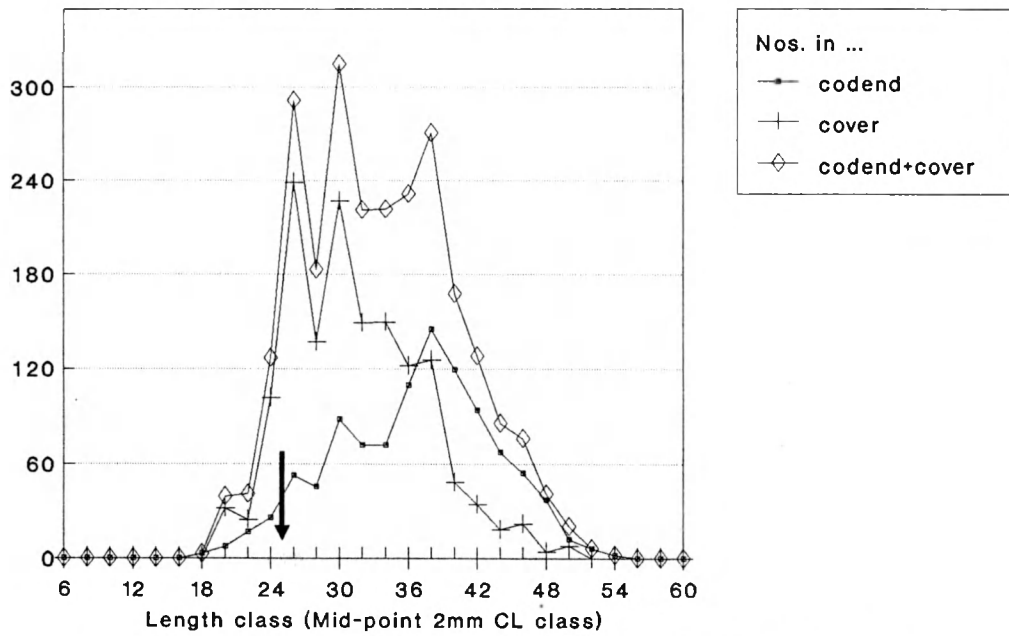


Figure 5.1.159 Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 35

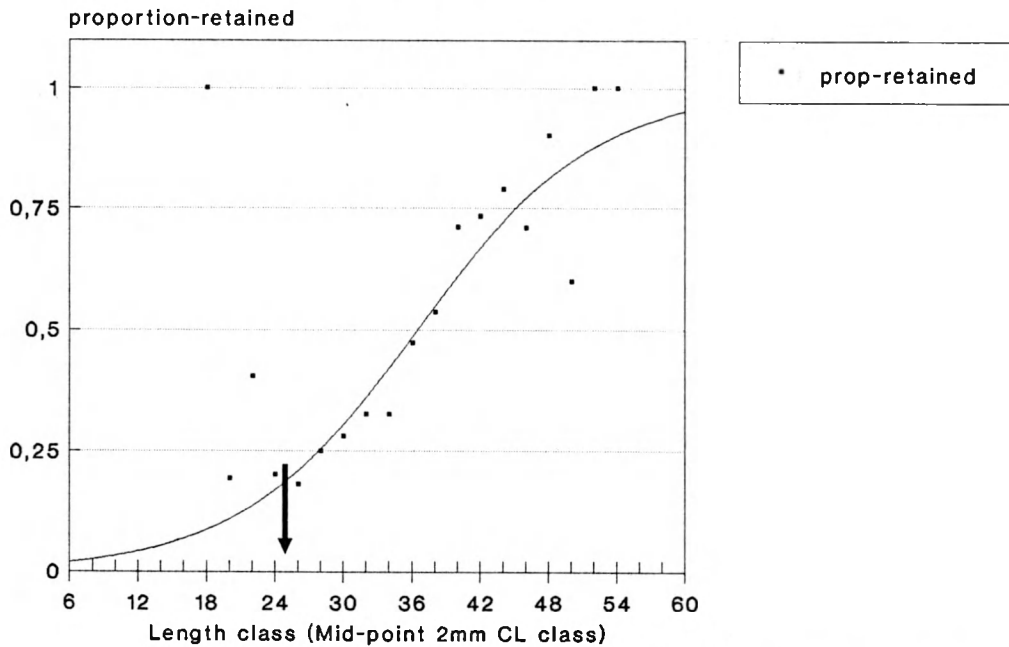
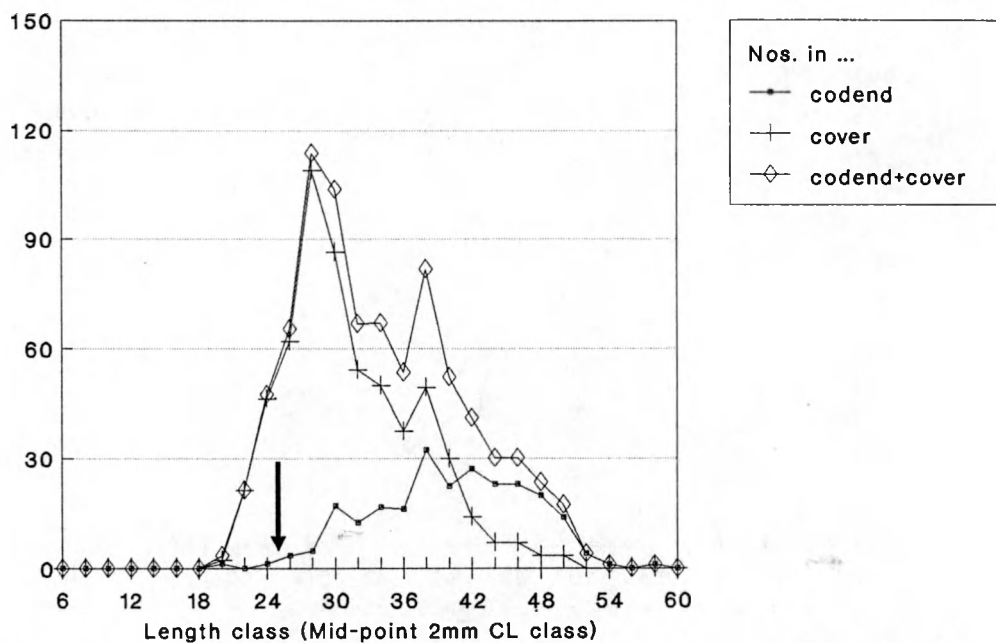


Figure 5.1.160. Arrow indicates minimum landing size

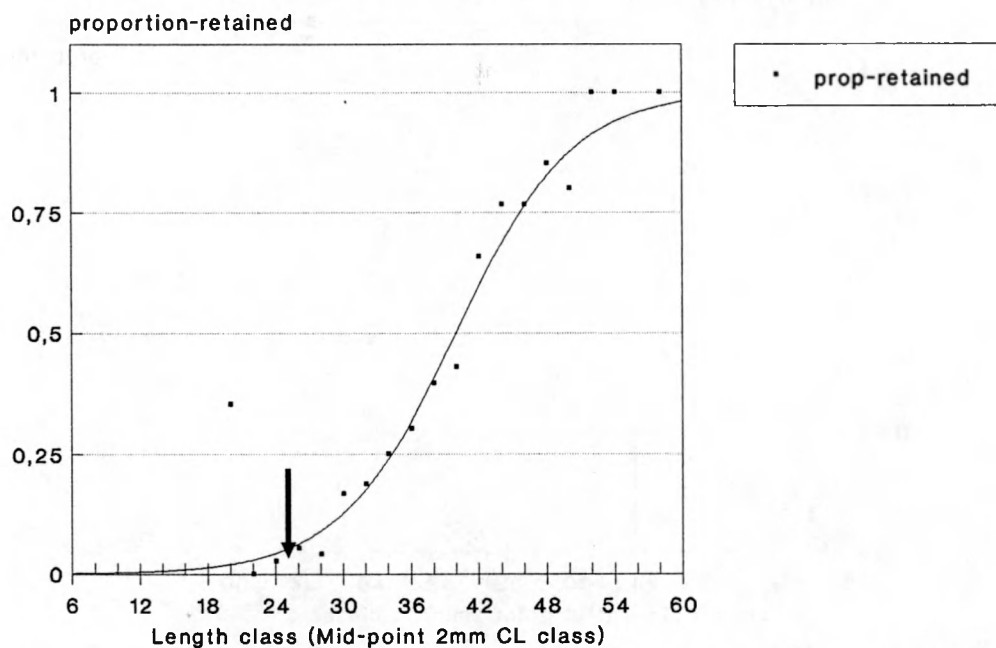
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 36



Arrow indicates minimum landing size

Figure 5.1.1.61

Nephrops selectivity study
 Campaign 2 : Haul 36



Arrow indicates minimum landing size

Figure 5.1.1.62

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 37

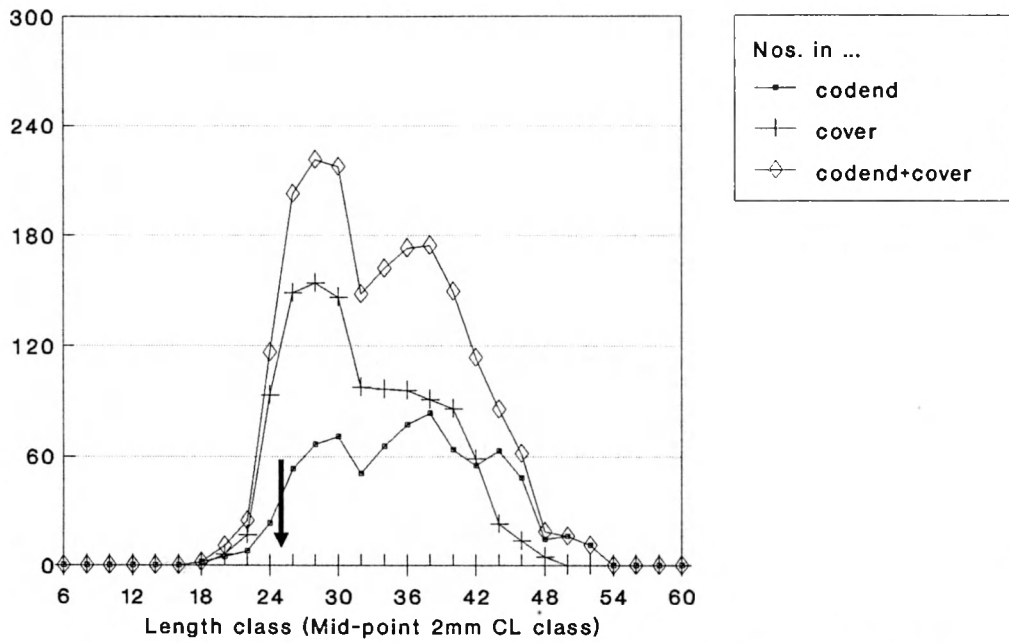


Figure 5.1.1.63

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 37

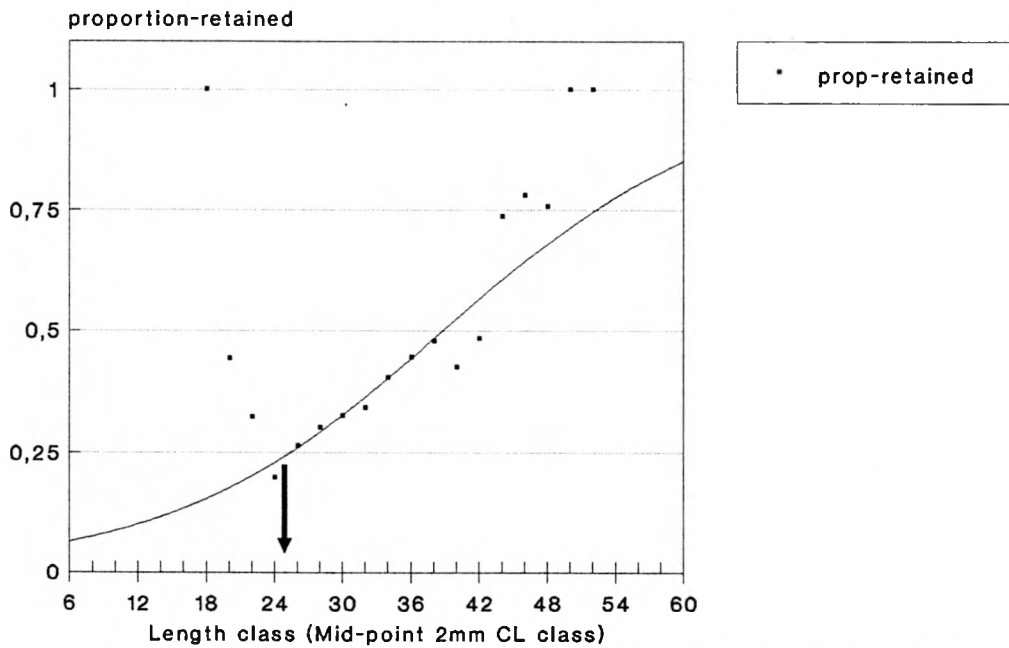
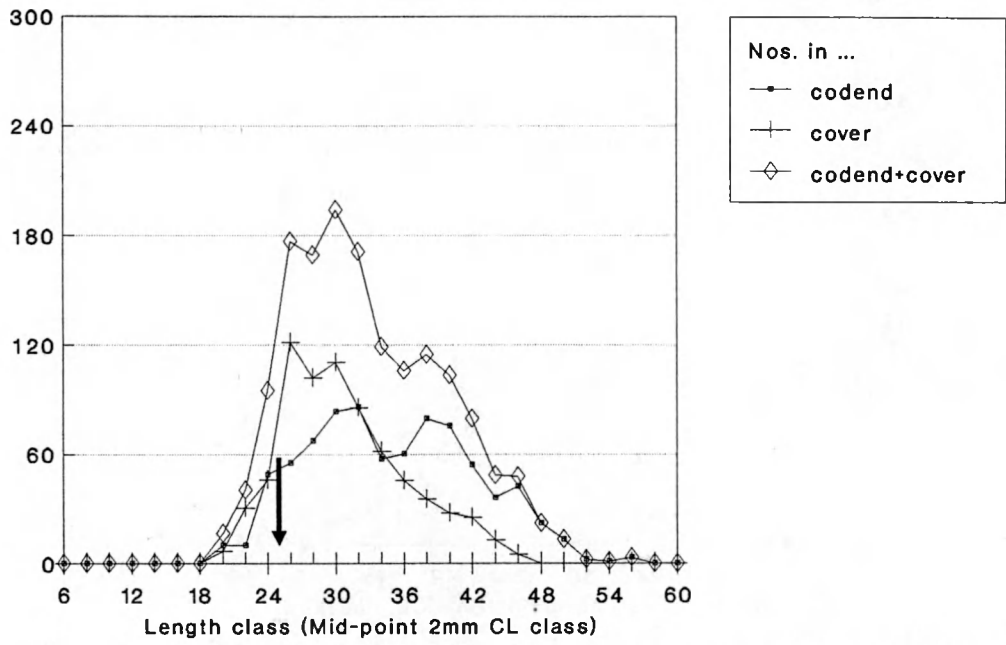


Figure 5.1.1.64

Arrow indicates minimum landing size

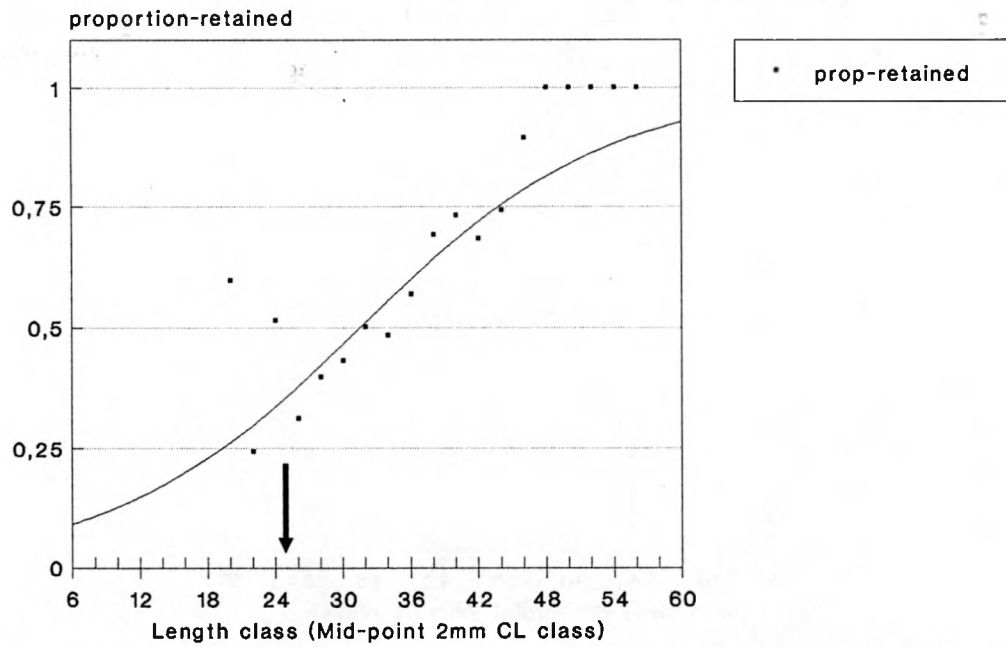
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 40



Arrow indicates minimum landing size

Figure 5.1.1.65

Nephrops selectivity study
 Campaign 2 : Haul 40



Arrow indicates minimum landing size

Figure 5.1.1.66

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 41

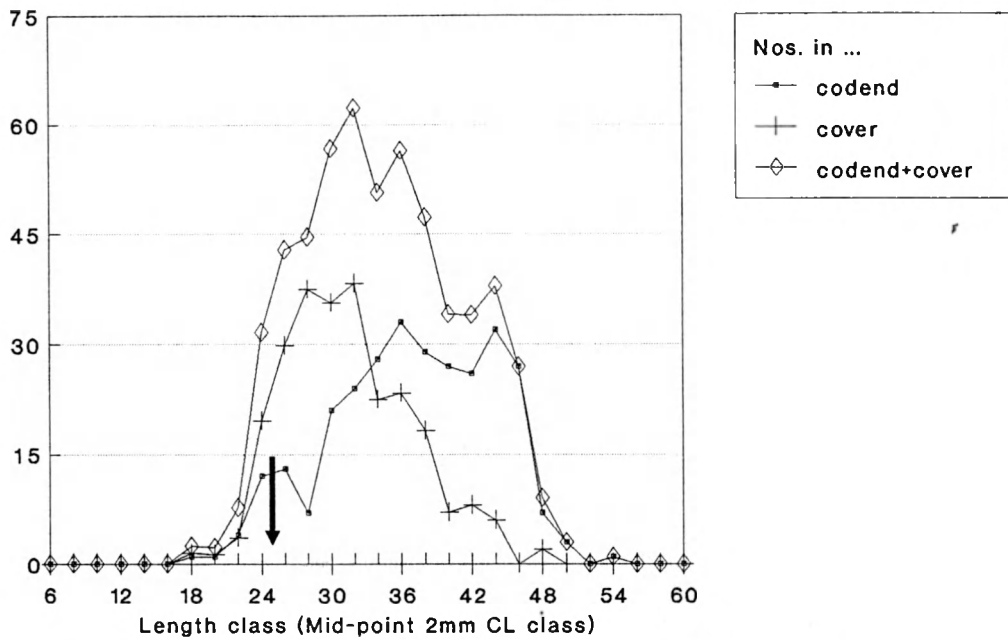


Figure 5.1.1.67

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 41

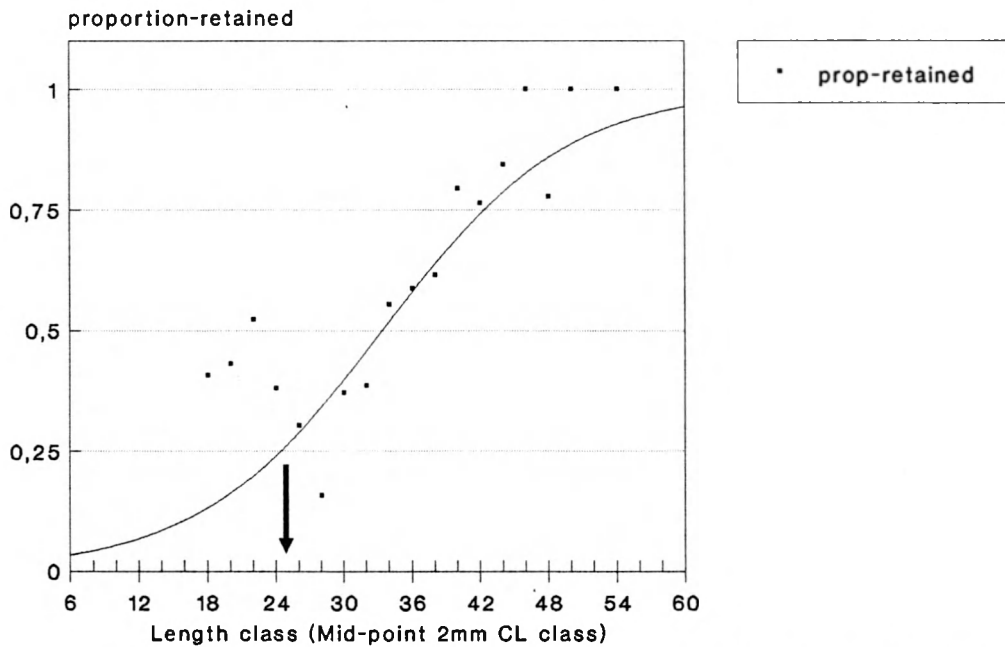
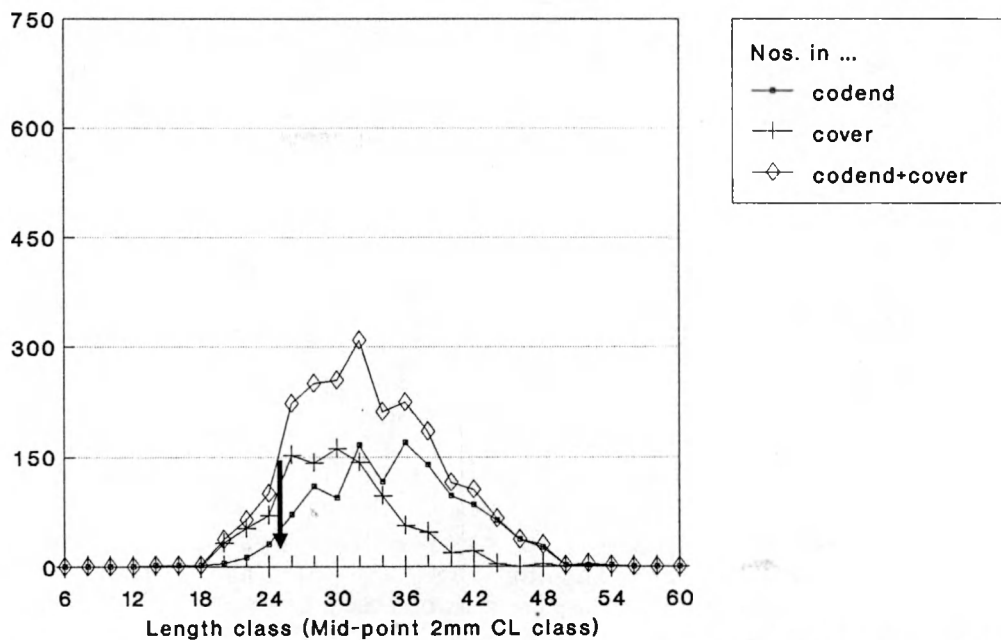


Figure 5.1.1.68

Arrow indicates minimum landing size

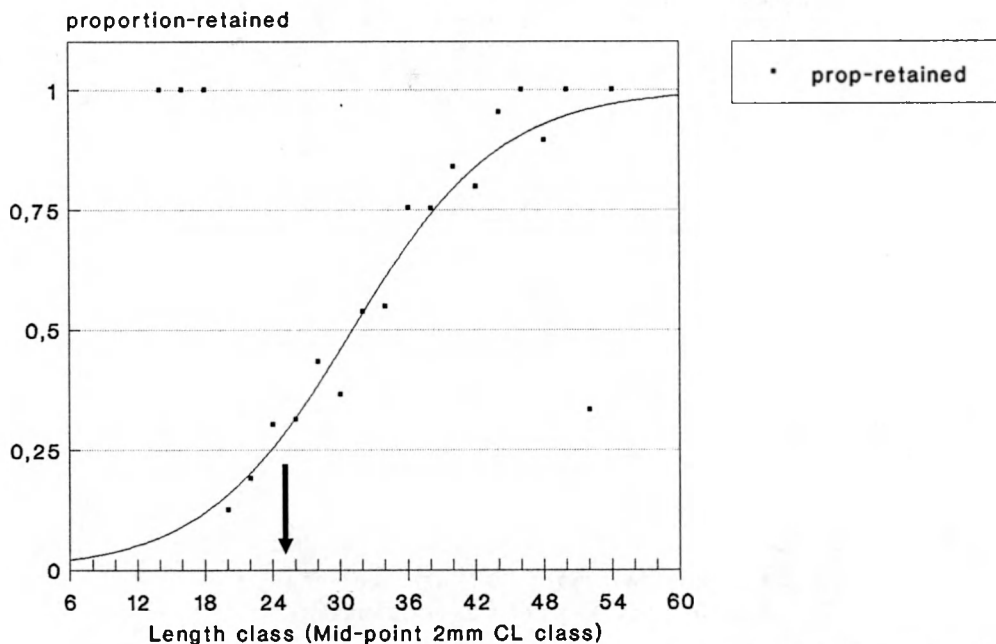
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 42



Arrow indicates minimum landing size

Figure 5.1.1.69

Nephrops selectivity study
 Campaign 2 : Haul 42



Arrow indicates minimum landing size

Figure 5.1.1.70

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 45

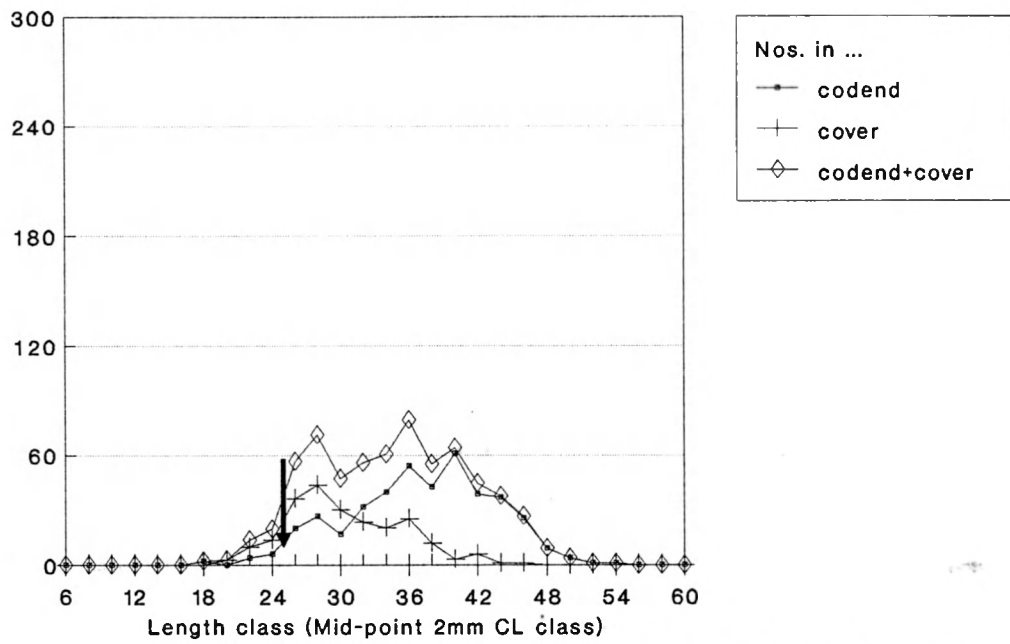


Figure 5.1.1.71

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 45

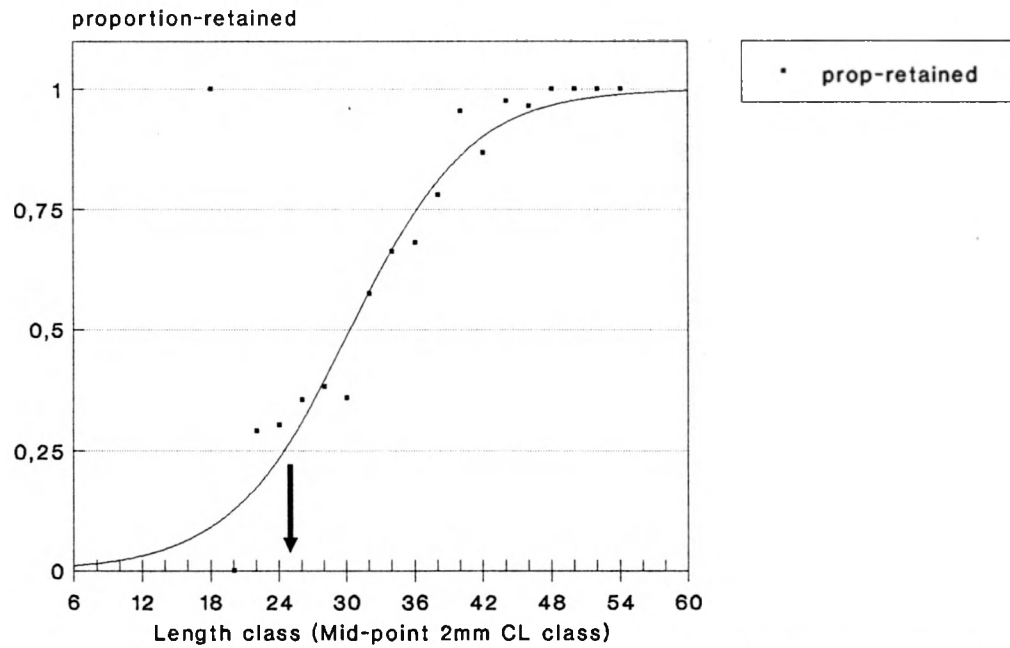


Figure 5.1.1.72

Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 47

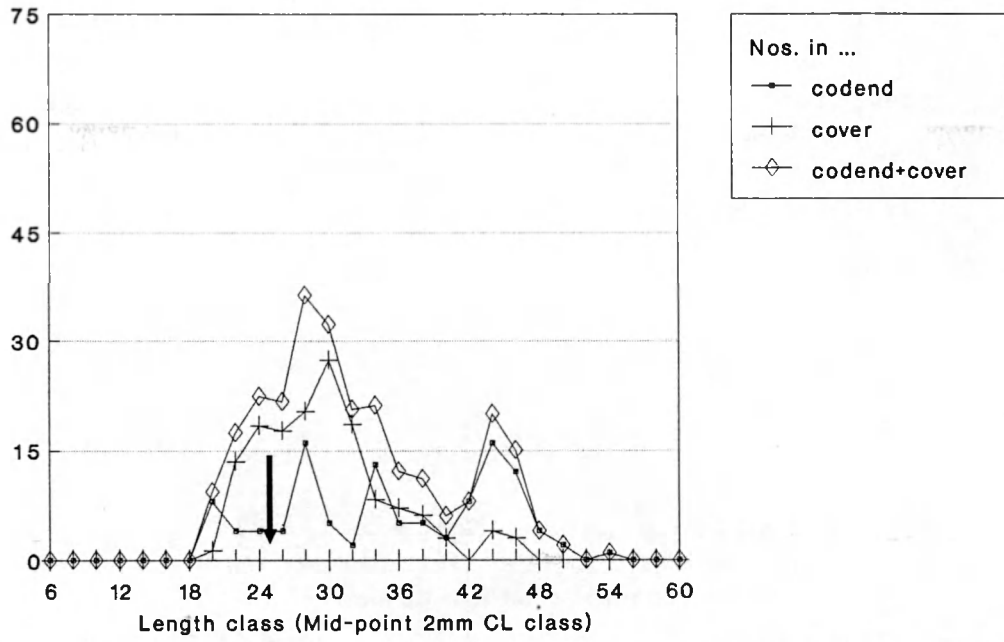


Figure 5.1.1.73

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 47

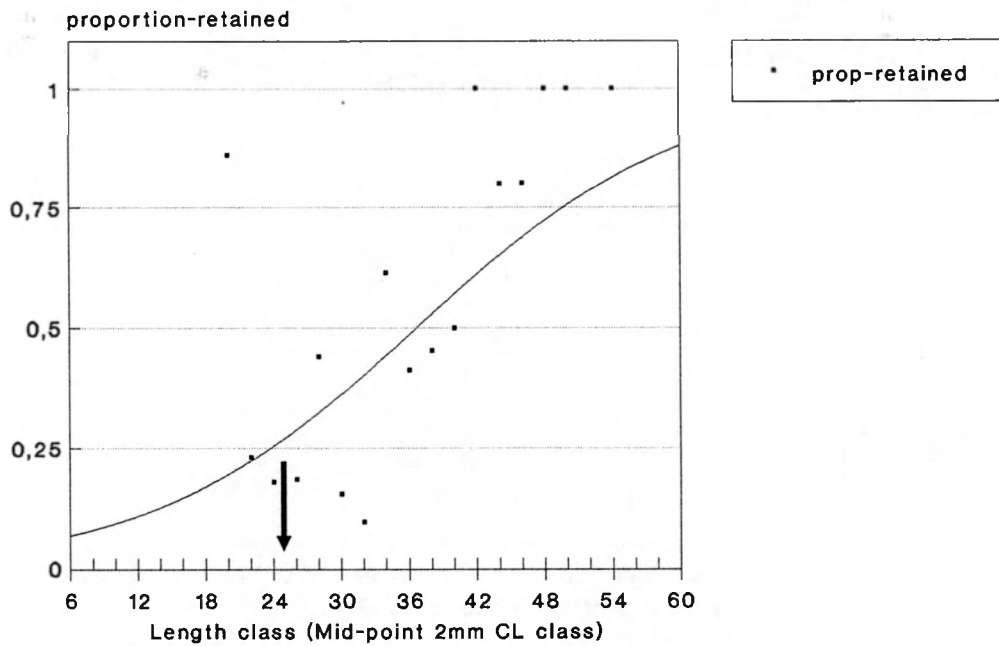


Figure 5.1.1.74

Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 48

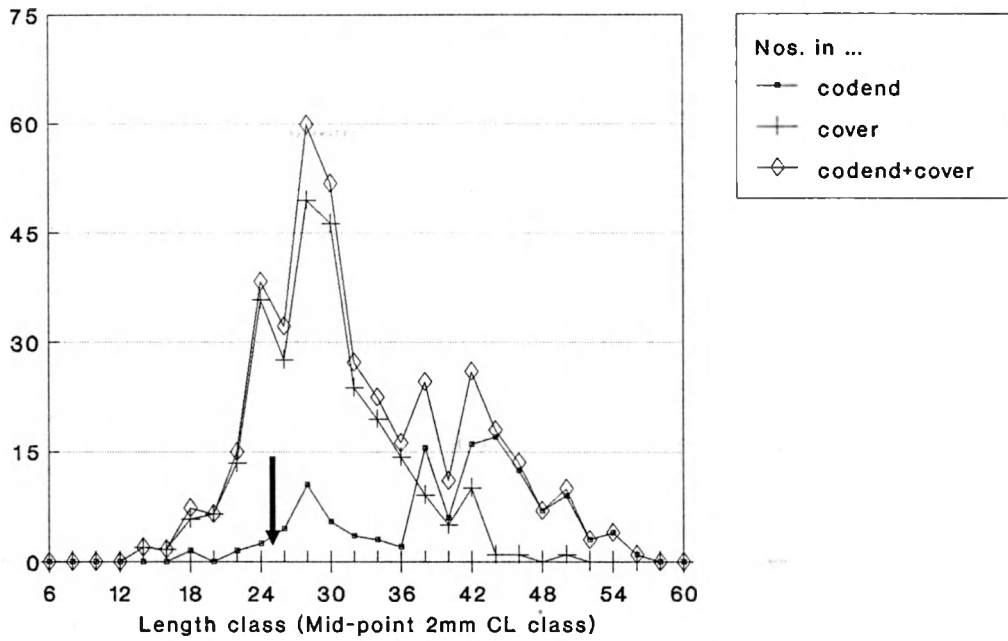


Figure 5.1.1.75

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 48

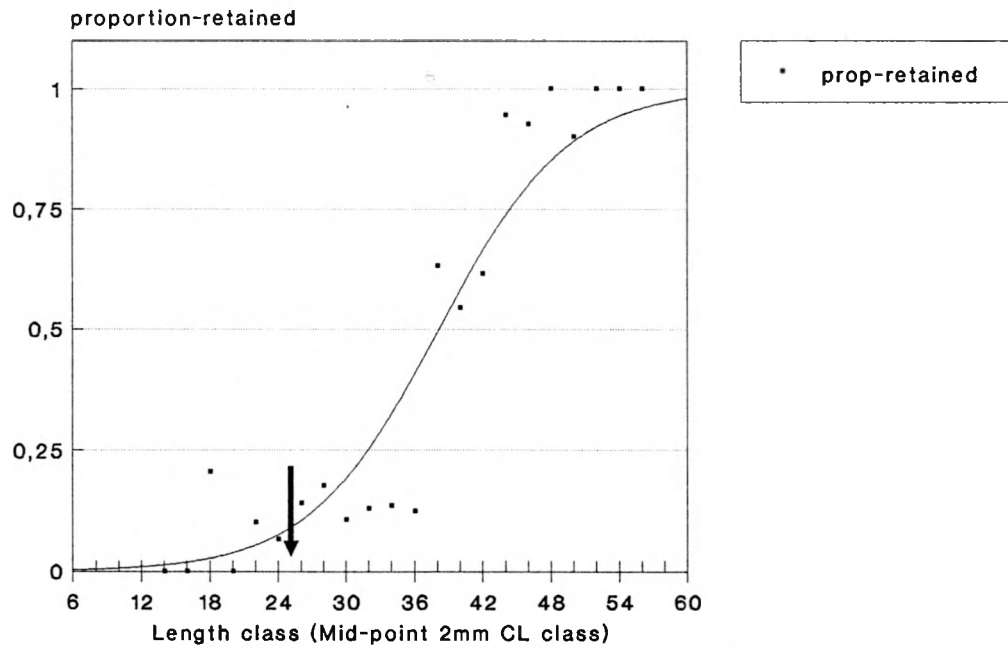
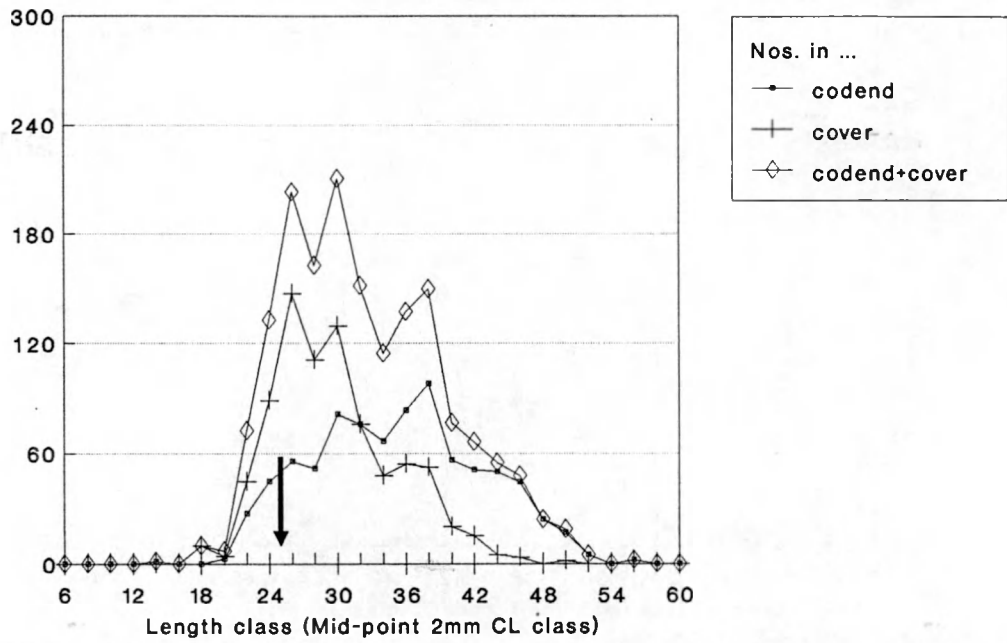


Figure 5.1.1.76

Arrow indicates minimum landing size

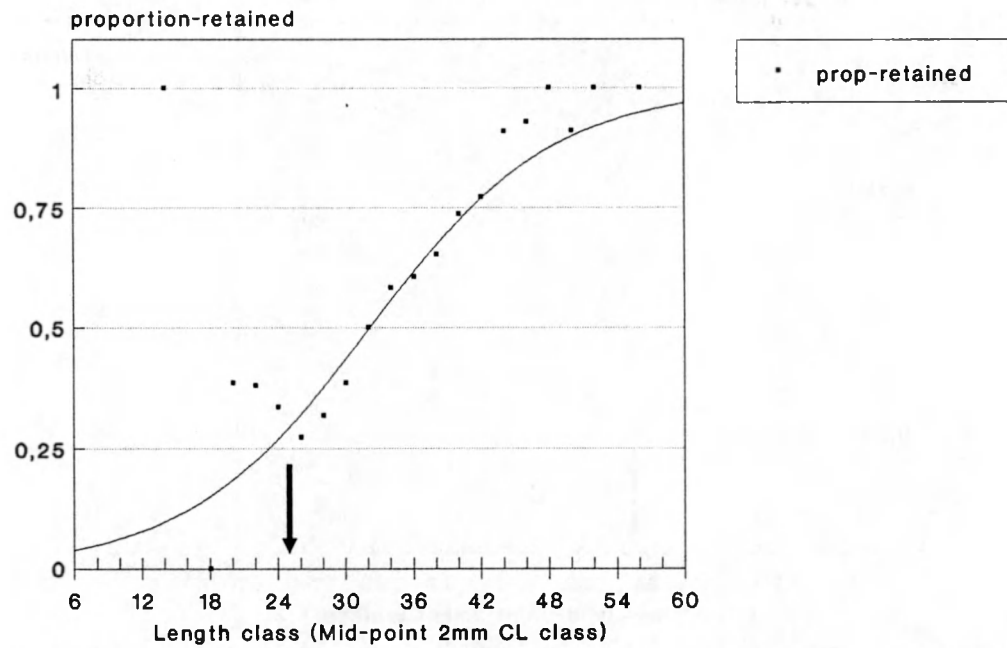
Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 49



Arrow indicates minimum landing size

Figure 5.1.1.77

Nephrops selectivity study
 Campaign 2 : Haul 49



Arrow indicates minimum landing size

Figure 5.1.1.78

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 51

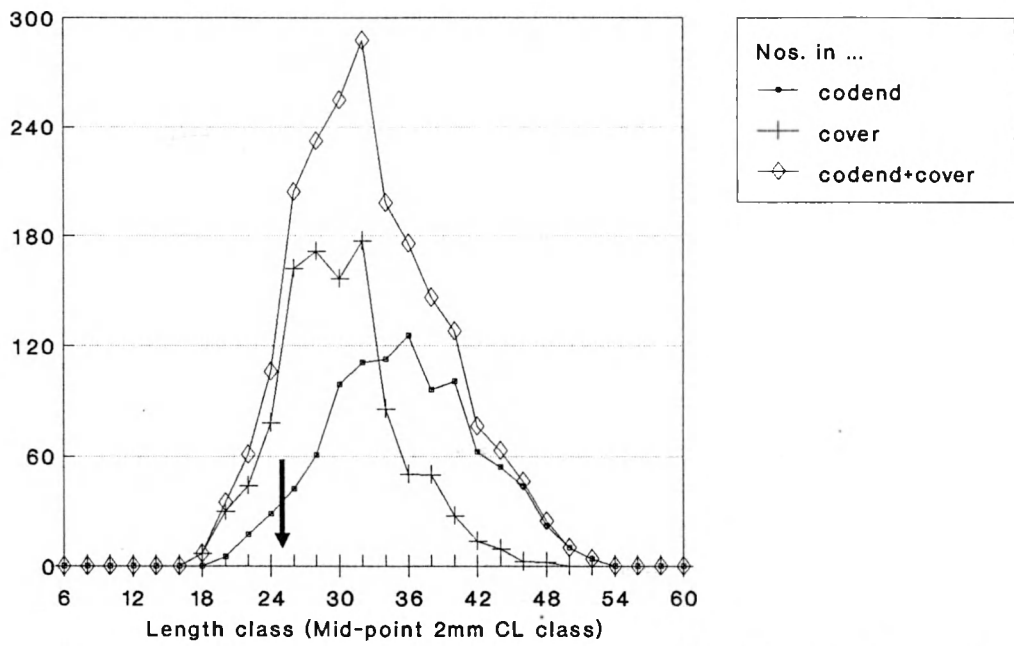


Figure 5.1.1.79

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 51

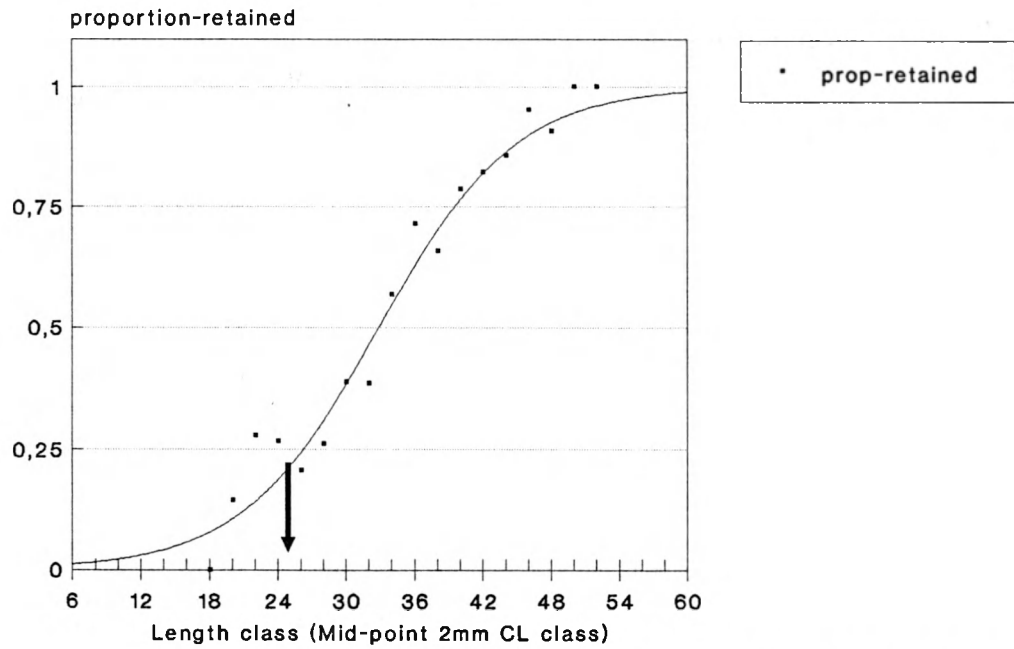


Figure 5.1.1.80

Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 52

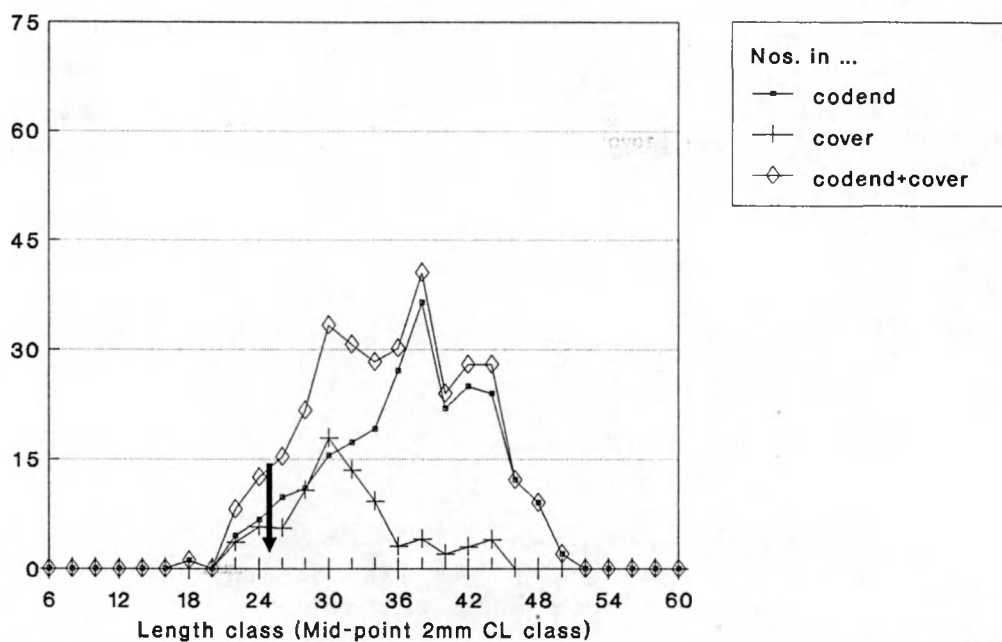


Figure 5.1.1.79 Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 52

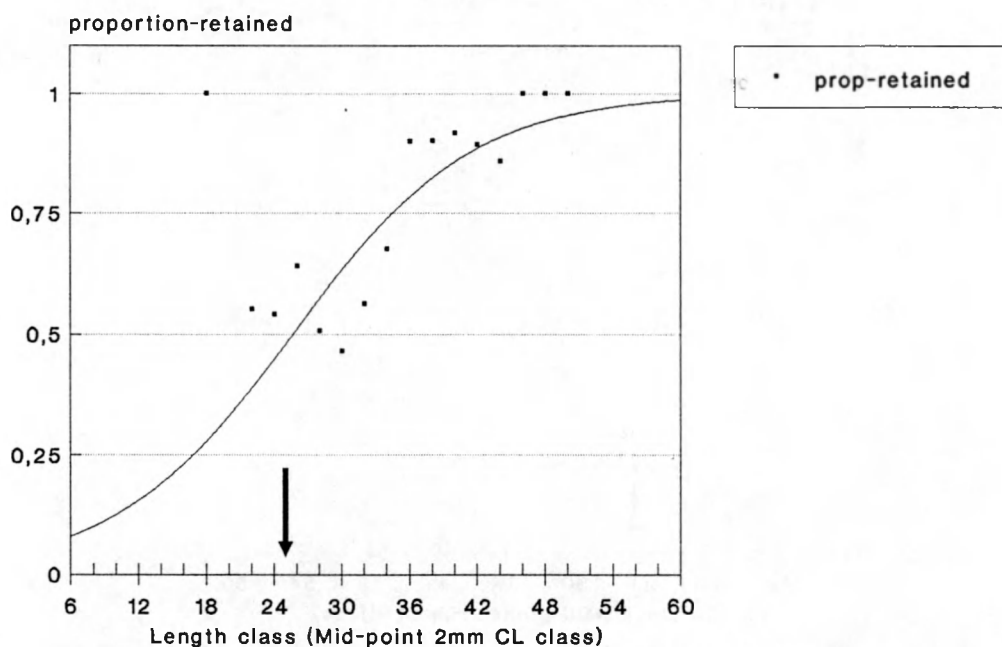


Figure 5.1.1.82 Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 54

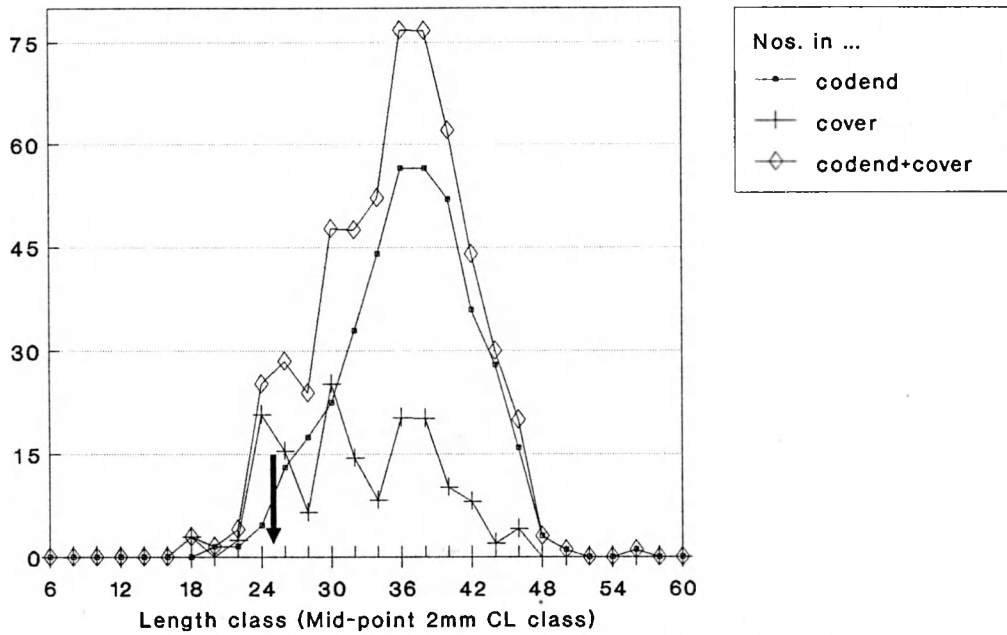


Figure 5.1.1.83 Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 54

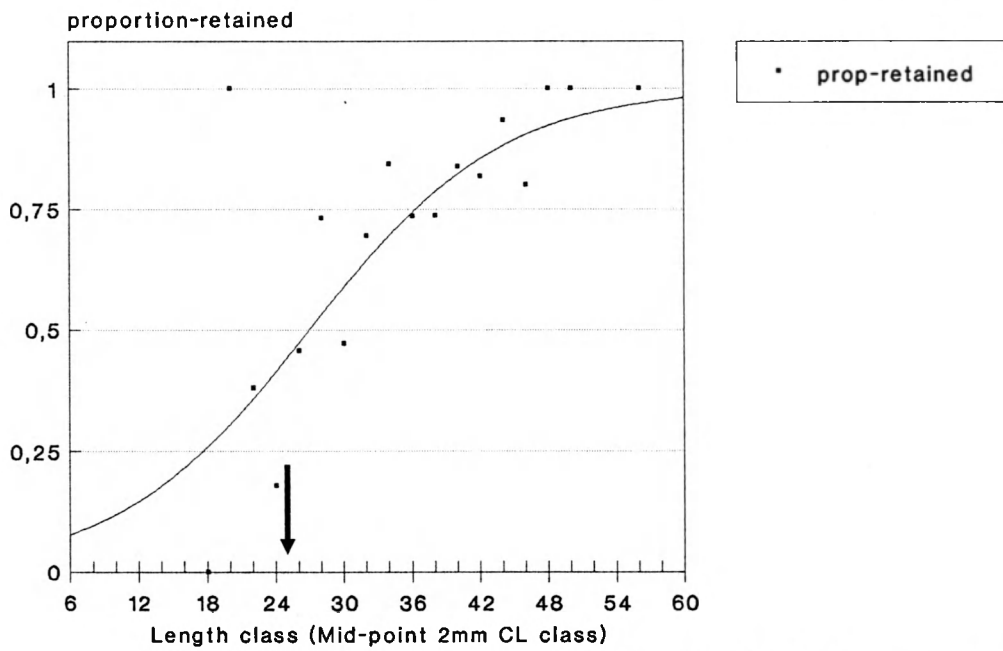


Figure 5.1.1.84 Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 55

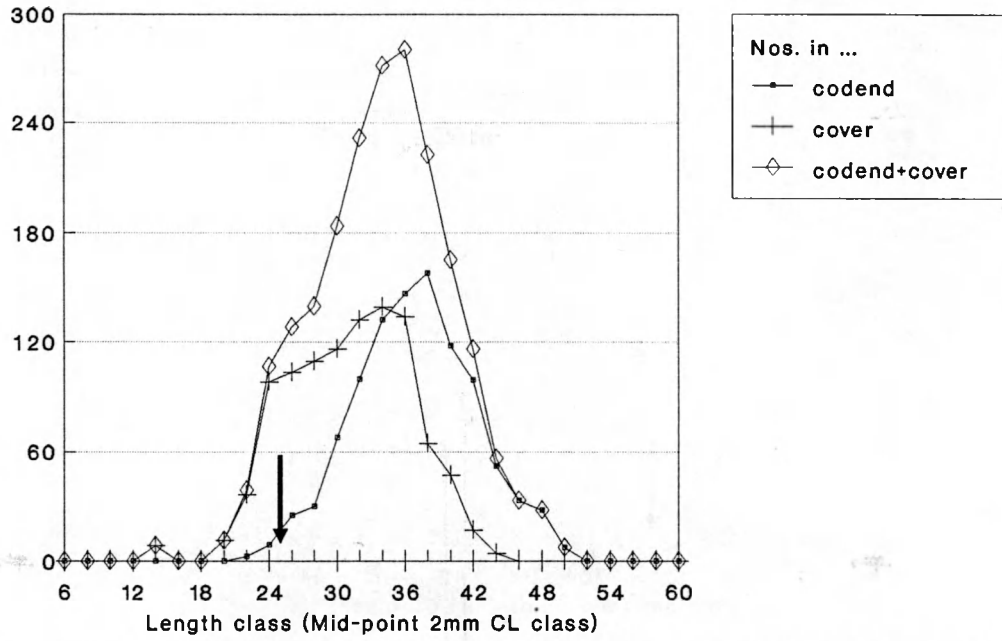


Figure 5.1.1.85

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 55

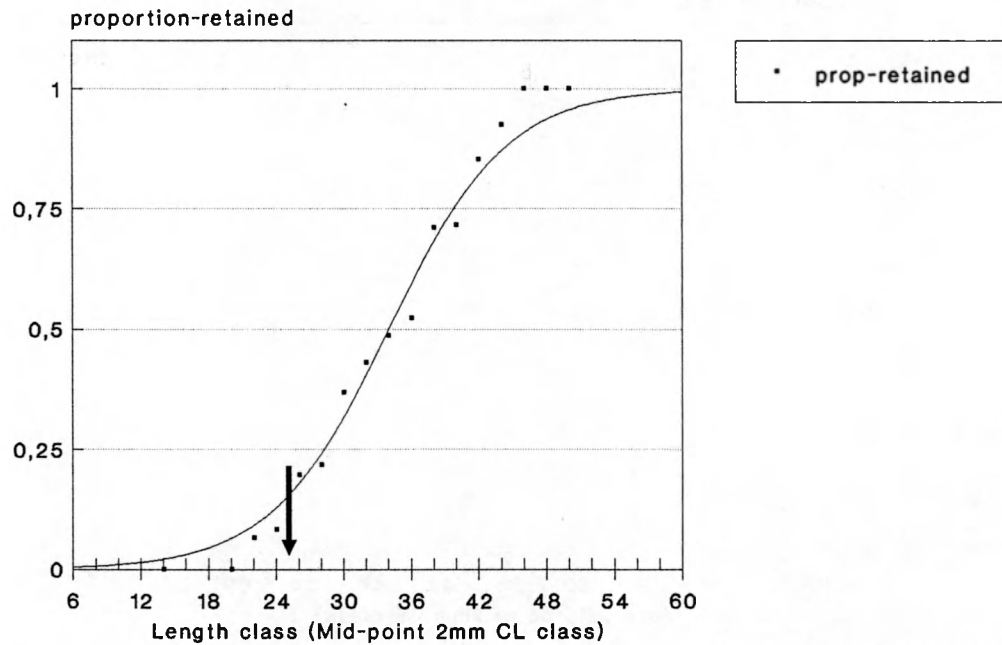


Figure 5.1.1.86

Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Campaign 2 : Haul 57

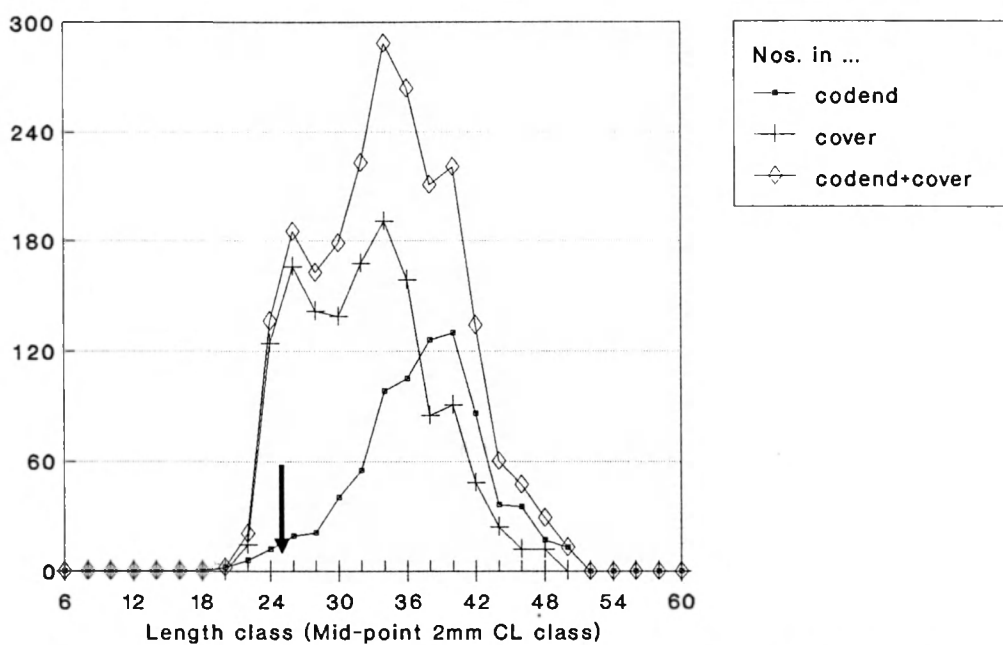


Figure 5.1.1.87

Arrow indicates minimum landing size

Nephrops selectivity study
 Campaign 2 : Haul 57

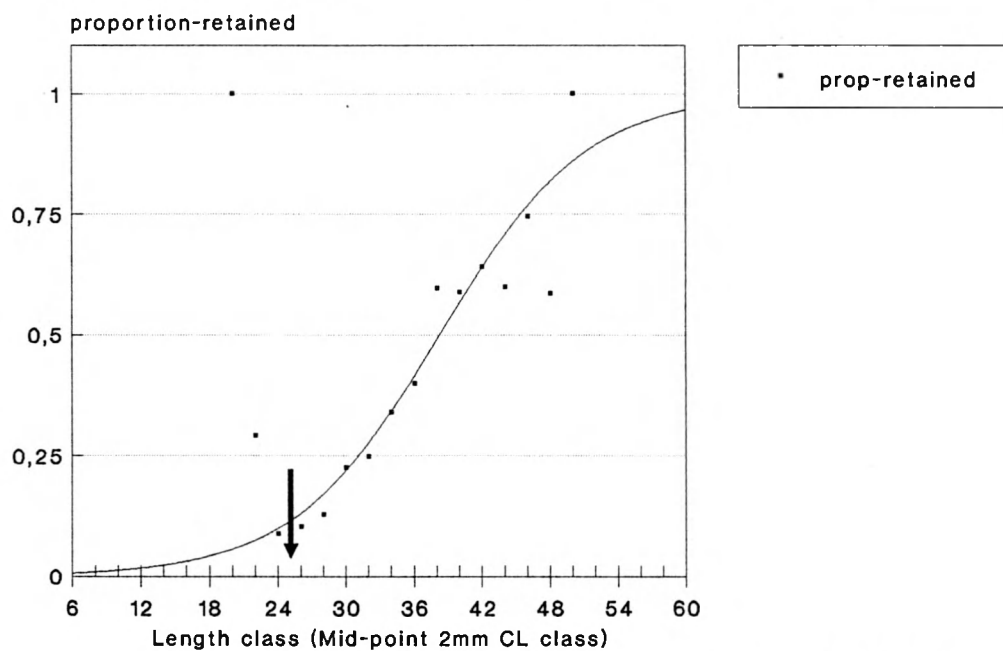


Figure 5.1.1.88

Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Standard trawl (70 mm codend)-no window

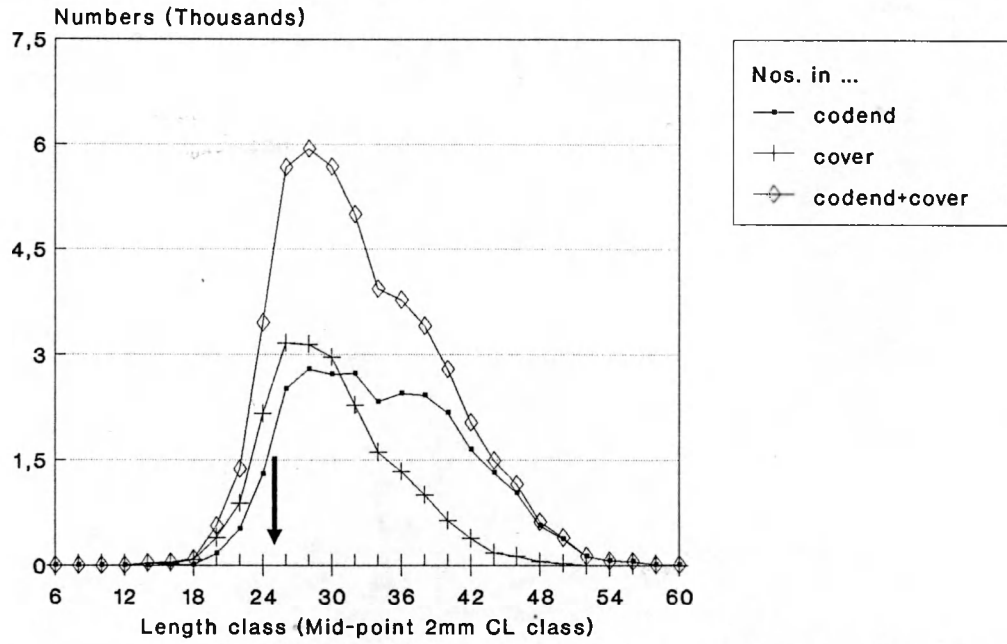


Figure 5.1.1.89. Arrow indicates minimum landing size

Nephrops selectivity study
 Standard trawl (70 mm codend)-no window

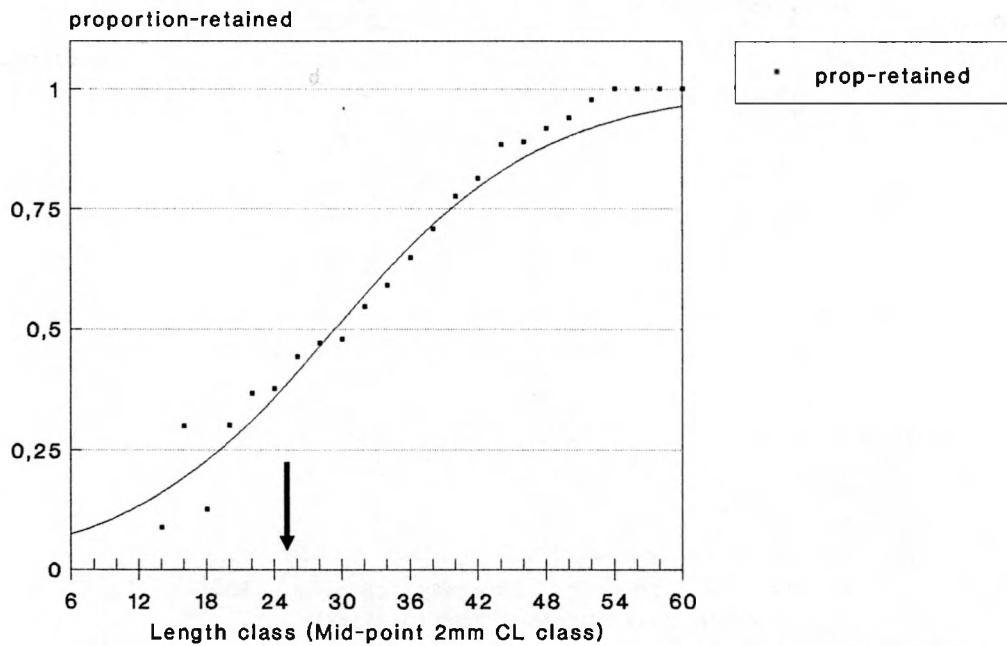
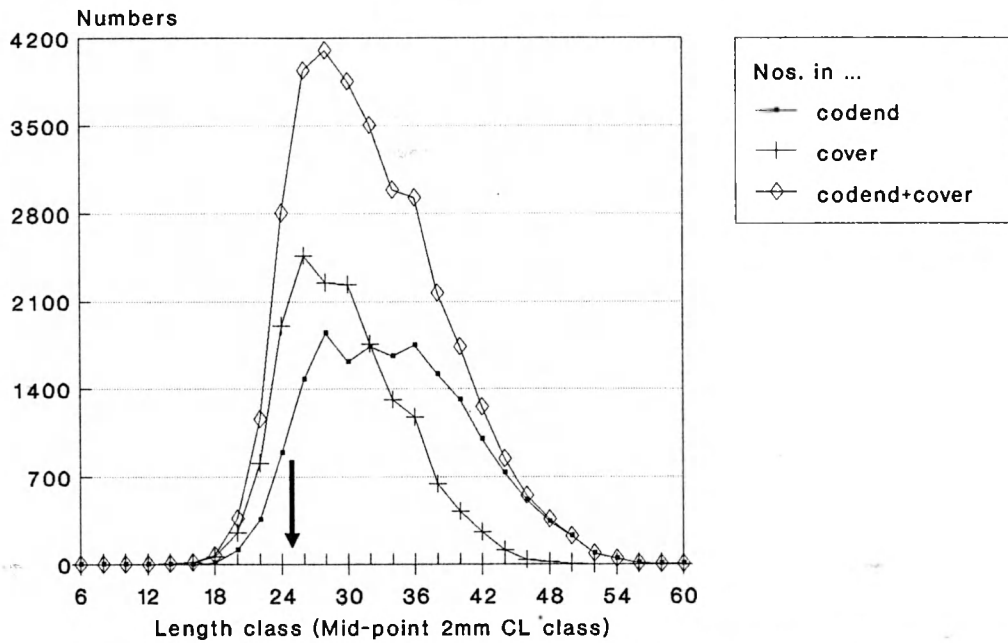


Figure 5.1.1.90. Arrow indicates minimum landing size

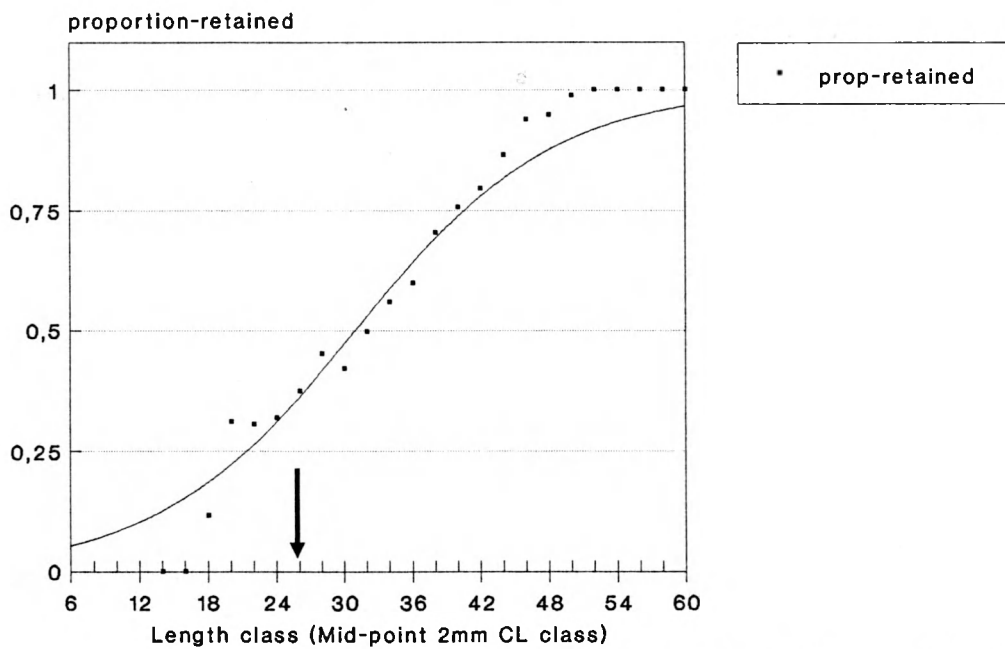
Nephrops selectivity study
 Numbers of Nephrops retained
 Square mesh window (90mm) in top panel



Arrow indicates minimum landing size

Figure 5.1.1.91.

Nephrops selectivity study
 Square mesh window (90mm) in top panel



Arrow indicates minimum landing size

Figure 5.1.1.92

Nephrops selectivity study
 Numbers of Nephrops retained
 Standard trawl (90mm codend)

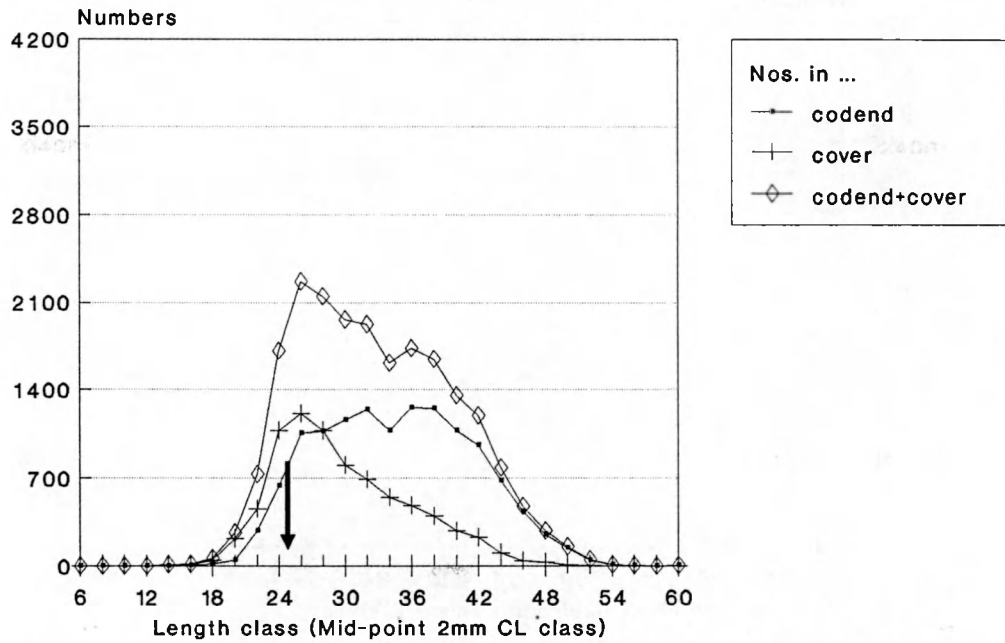


Figure 5.1.1.93

Arrow indicates minimum landing size

Nephrops selectivity study
 Standard trawl (90mm codend)

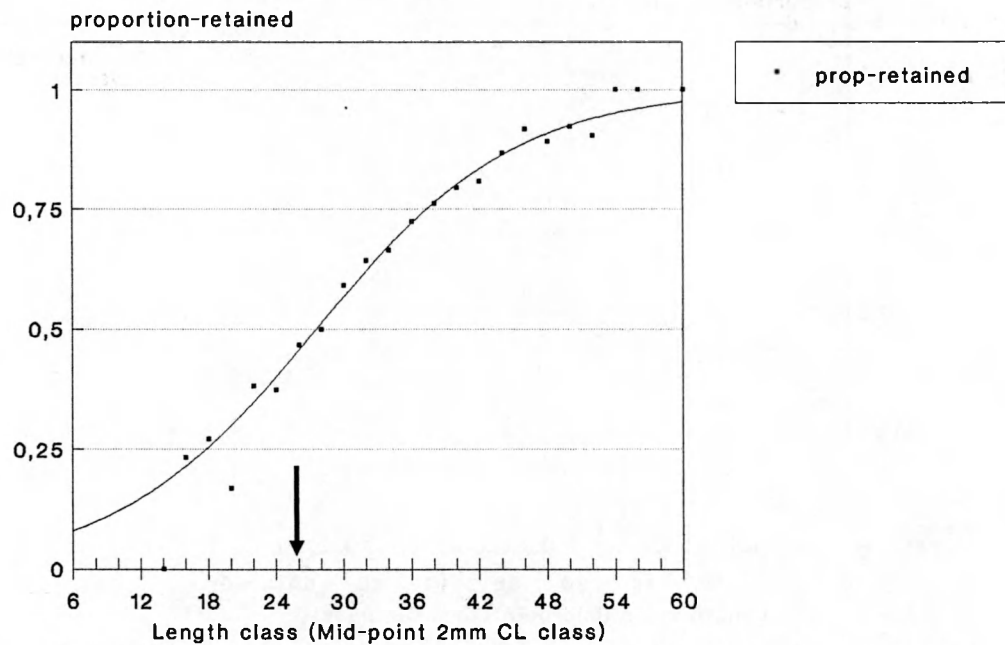
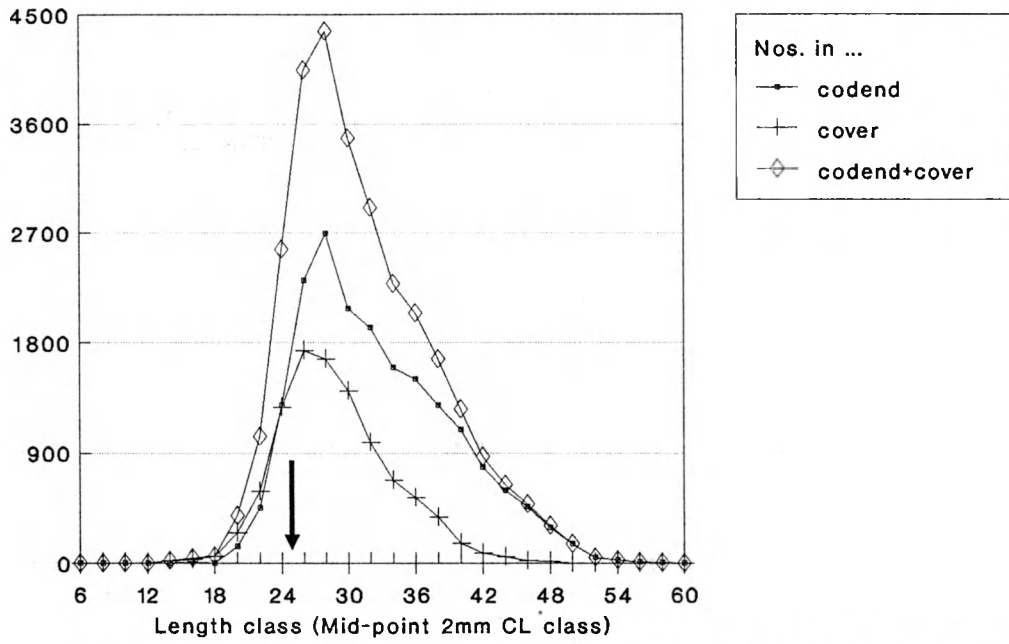


Figure 5.1.1.94

Arrow indicates minimum landing size

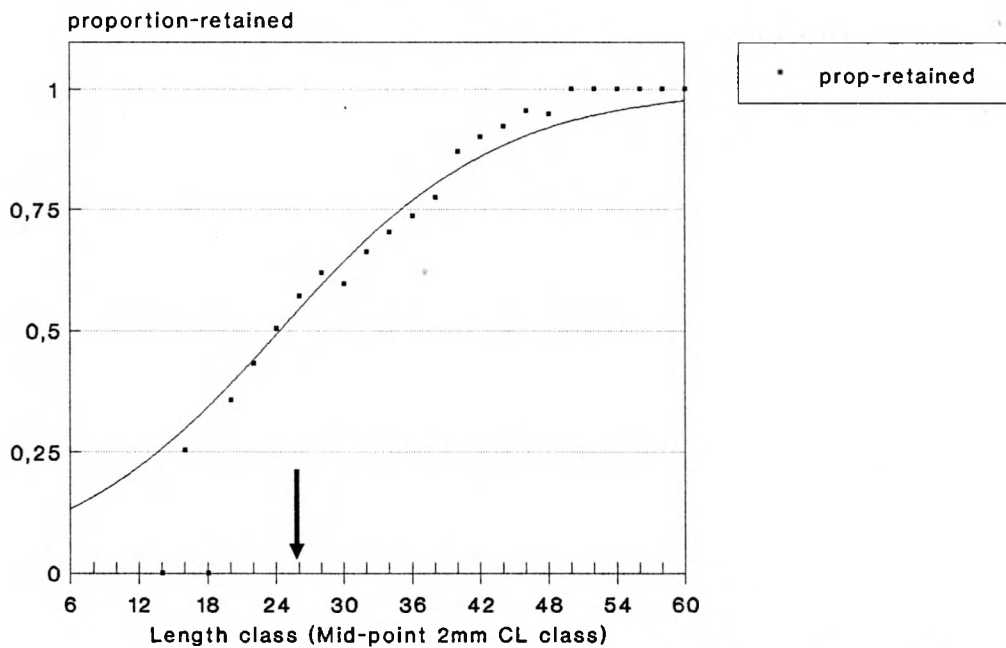
Nephrops selectivity study
Numbers of Nephrops retained
Seastate calm



Arrow indicates minimum landing size

Figure 5.1.1.95

Nephrops selectivity study
Standard trawl - seastate calm



Arrow indicates minimum landing size

Figure 5.1.1.96

Nephrops selectivity study
 Numbers of Nephrops retained
 Standard trawl - Seastate smooth

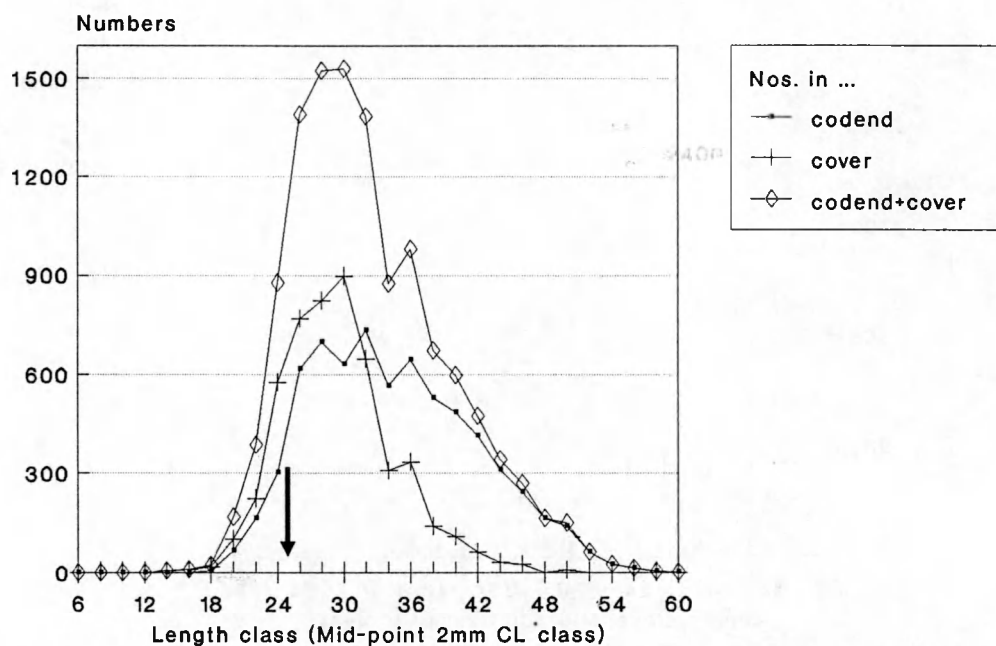


Figure 5.1.1.97 Arrow indicates minimum landing size

Nephrops selectivity study
 Standard trawl - seastate smooth

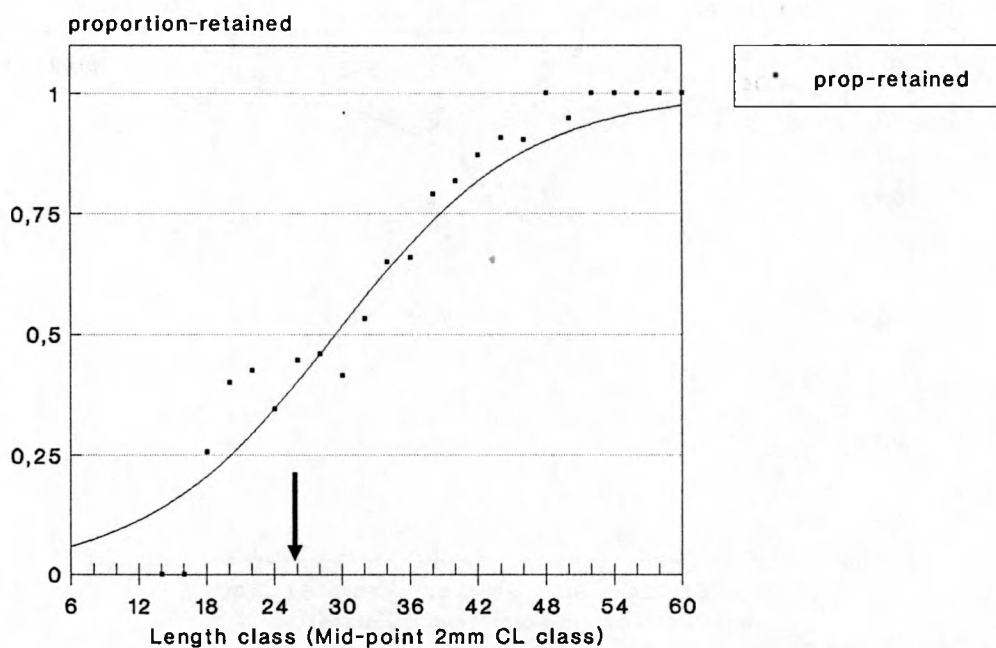
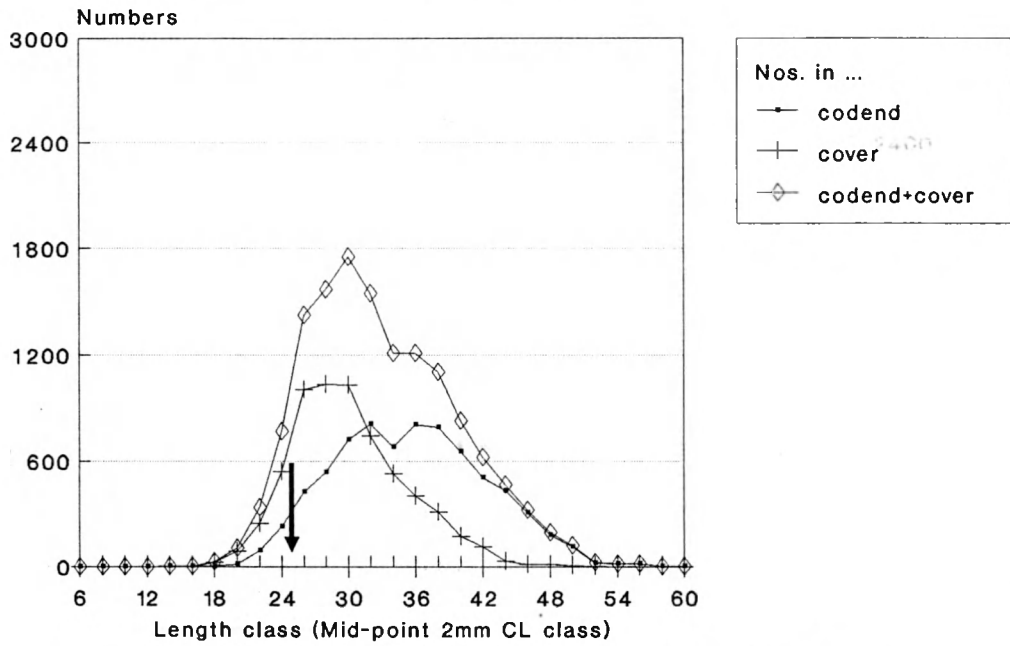


Figure 5.1.1.98 Arrow indicates minimum landing size

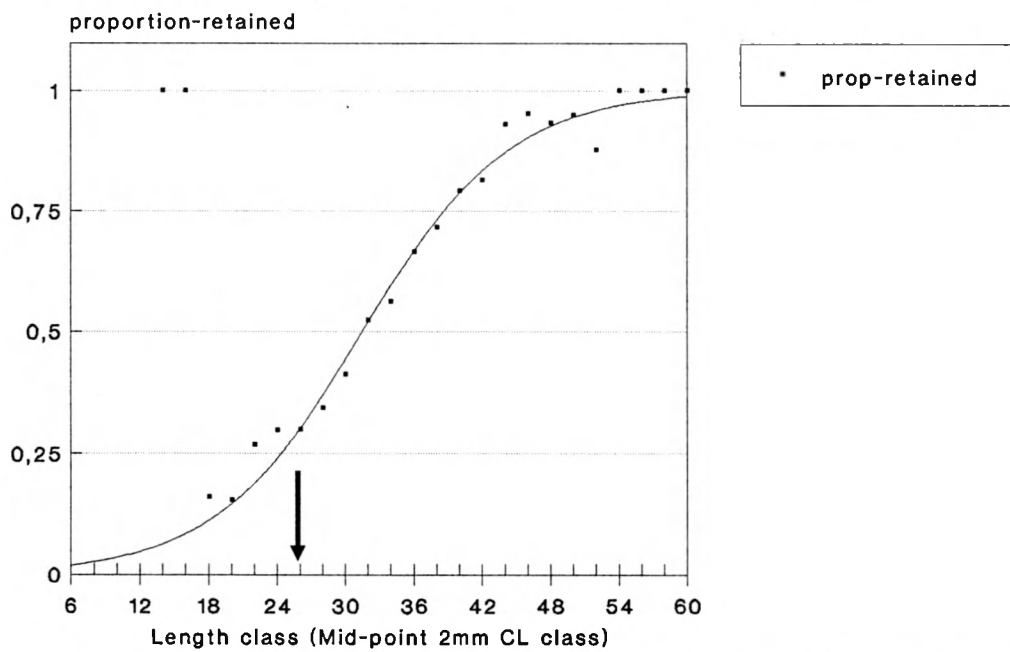
Nephrops selectivity study
 Numbers of Nephrops retained
 Standard trawl - Seastate slight



Arrow indicates minimum landing size

Figure 5.1.1.99

Nephrops selectivity study
 Standard trawl - seastate slight



Arrow indicates minimum landing size

Figure 5.1.1.100

Nephrops selectivity study
 Numbers of Nephrops retained
 Standard trawl - Seastate moderate

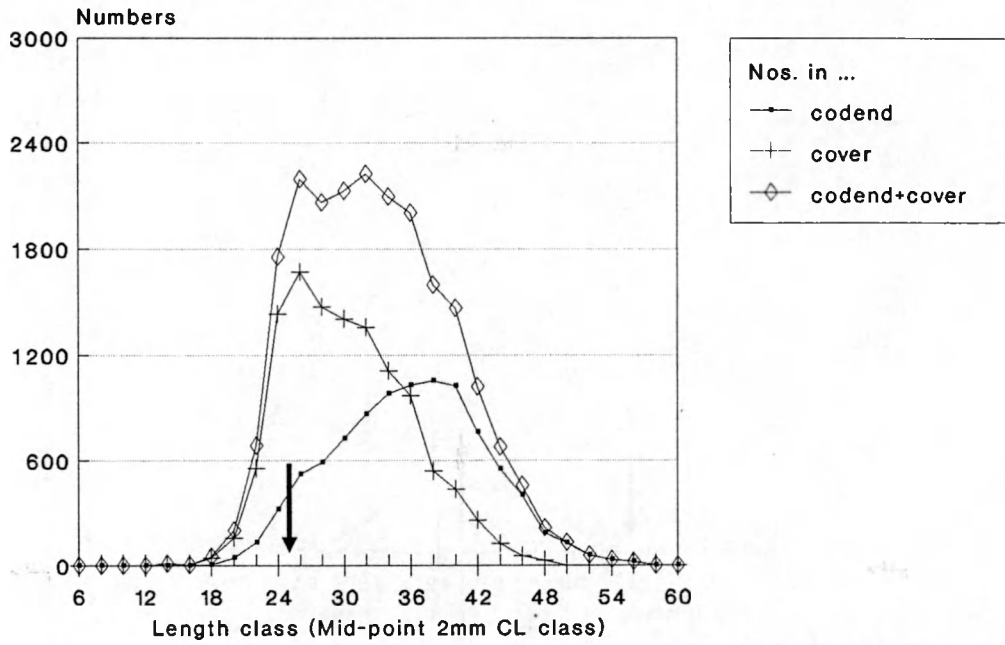


Figure 5.1.1.101

Arrow indicates minimum landing size

Nephrops selectivity study
 Standard trawl - seastate moderate

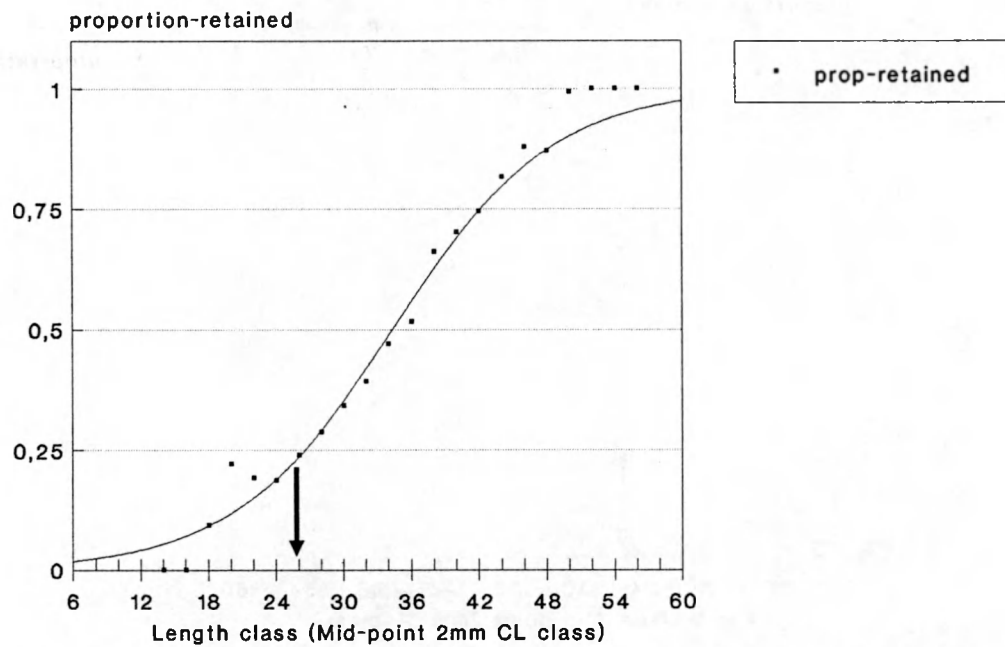


Figure 5.1.1.102

Arrow indicates minimum landing size

Nephrops selectivity study
 Numbers of Nephrops retained
 Standard trawl - Seastate rough

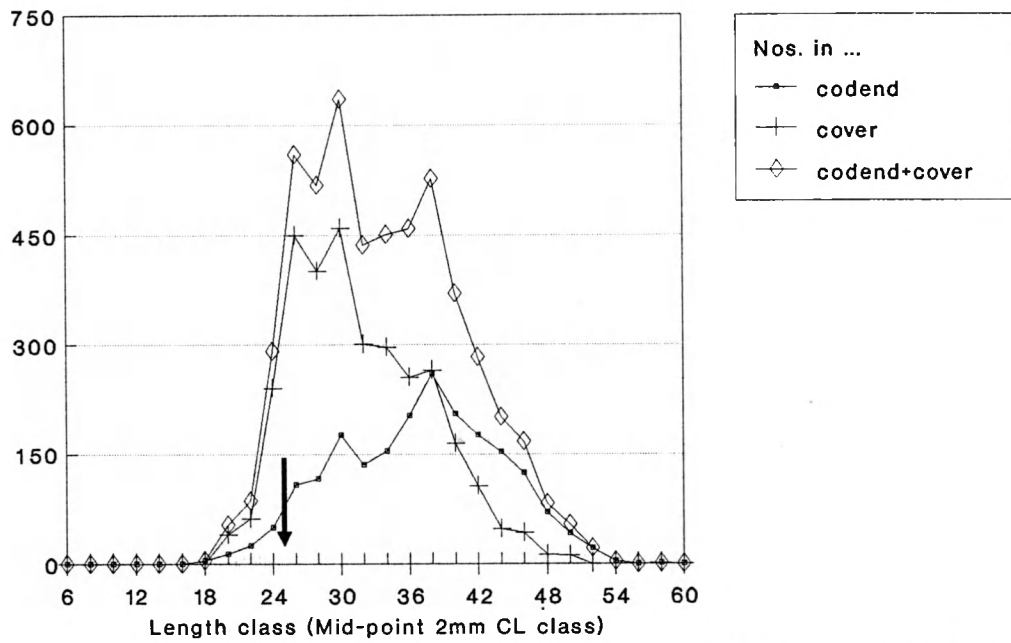


Figure 5.1.1.103

Arrow indicates minimum landing size

Nephrops selectivity study
 Standard trawl - seastate rough

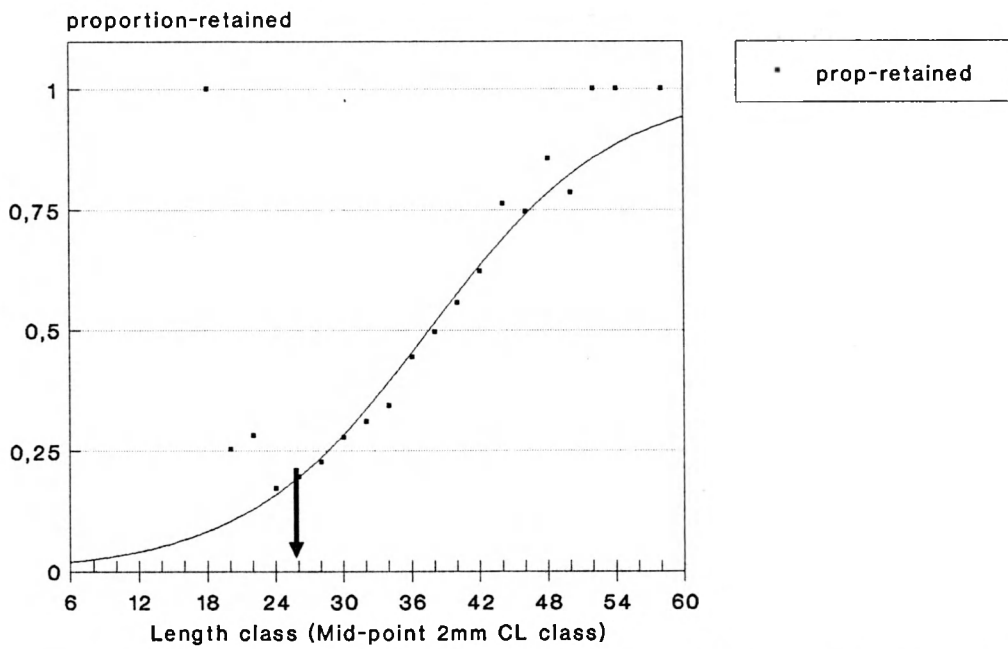
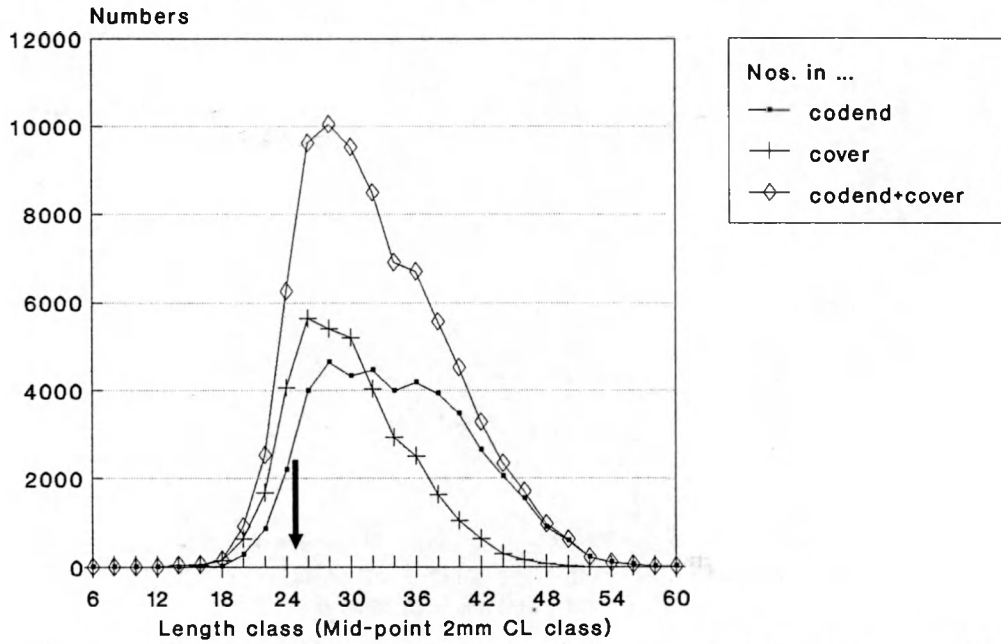


Figure 5.1.1.104

Arrow indicates minimum landing size

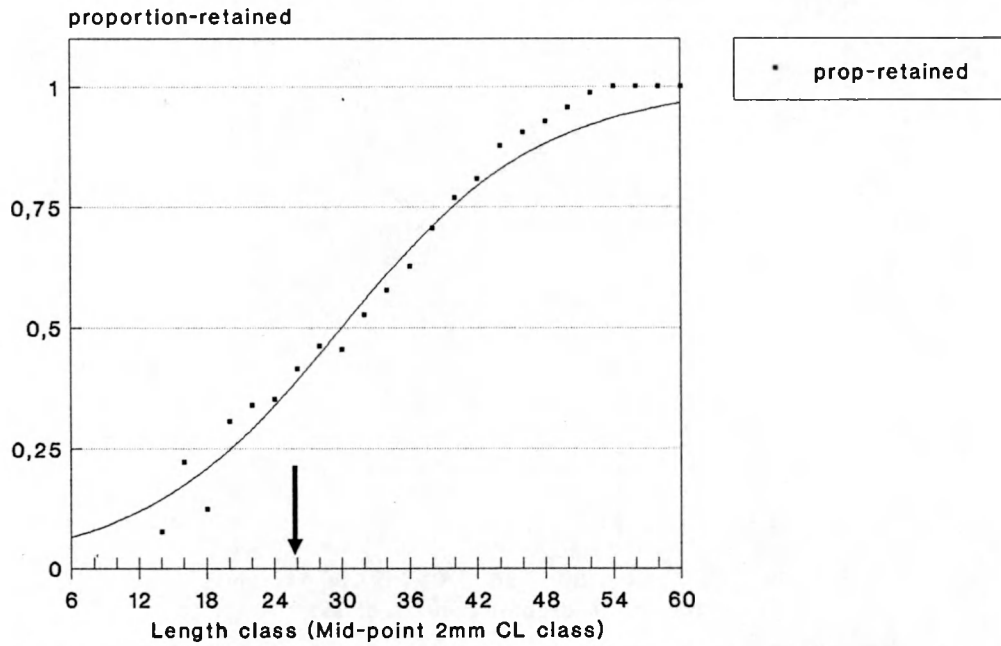
Nephrops selectivity study
 Numbers of Nephrops retained
 Standard trawl (70mm codend)- all hauls



Arrow indicates minimum landing size

Figure 5.1.1.105

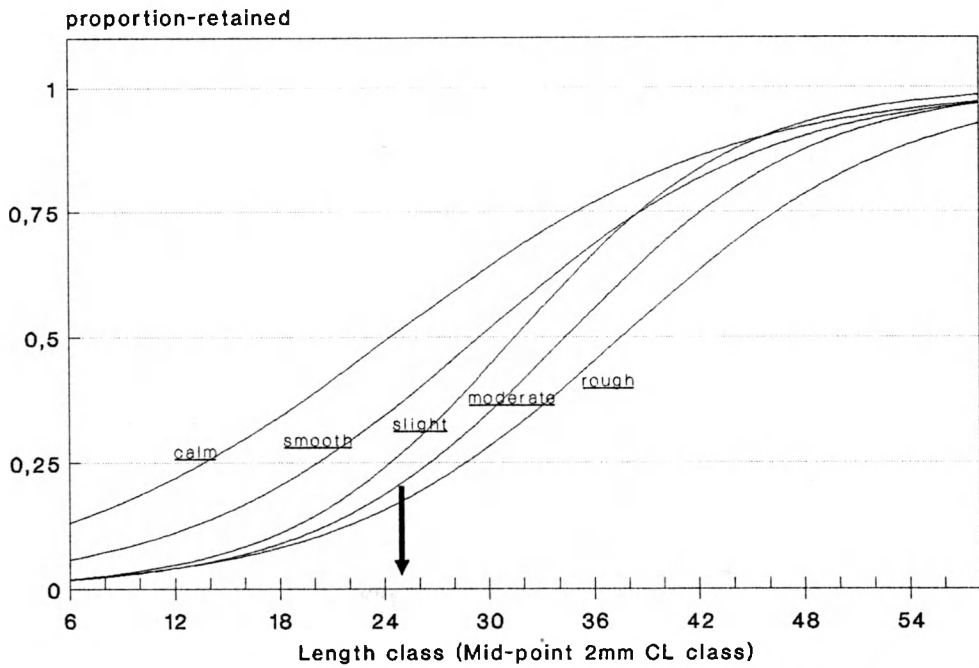
Nephrops selectivity study
 Standard trawl (70 mm codend)-all hauls



Arrow indicates minimum landing size

Figure 5.1.1.106

Nephrops selectivity study
Selectivity related to seastate



Arrow indicates minimum landing size

Figure 5.1.1.107

Nephrops selectivity study
L50 and selection range in relation
with seastate

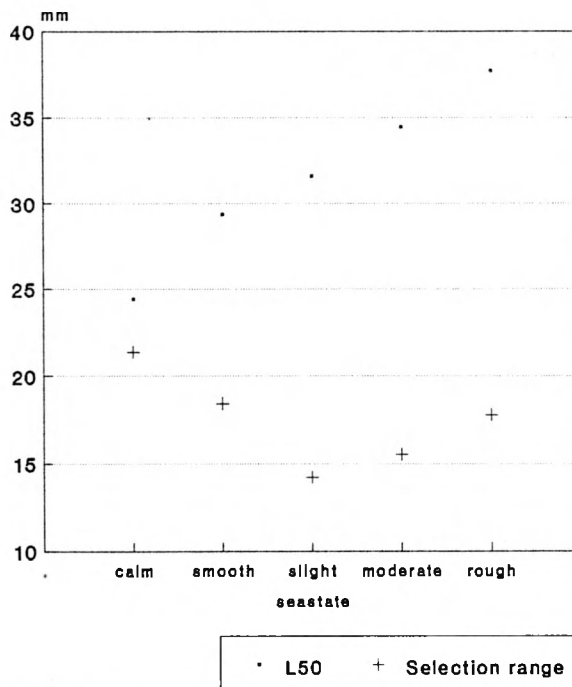


Figure 6.1.1.108

Nephrops selectivity study
 Selection with and without square window

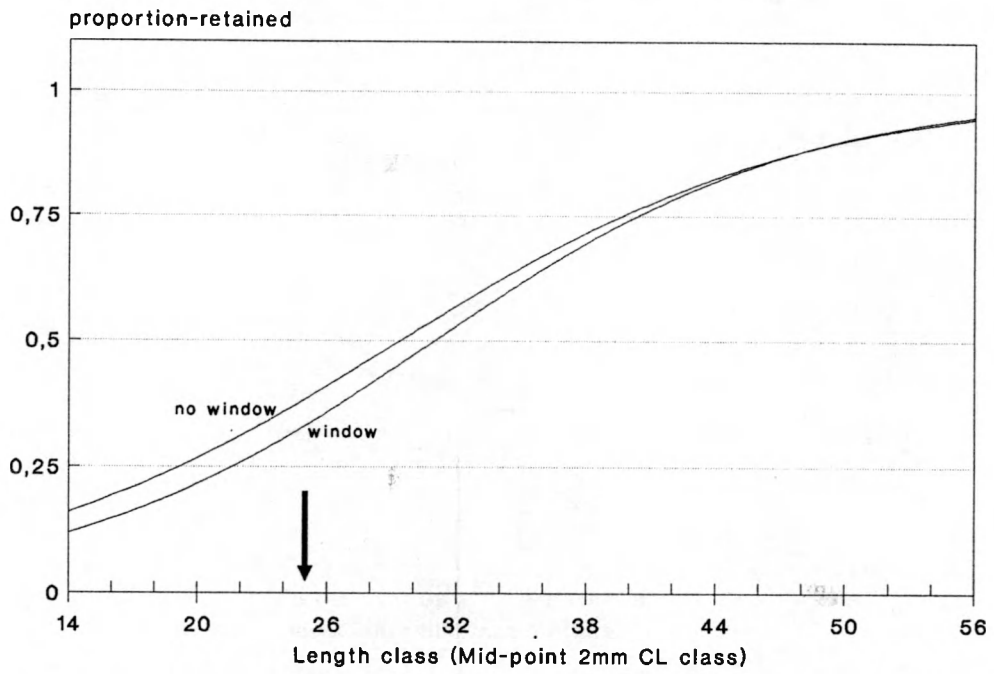
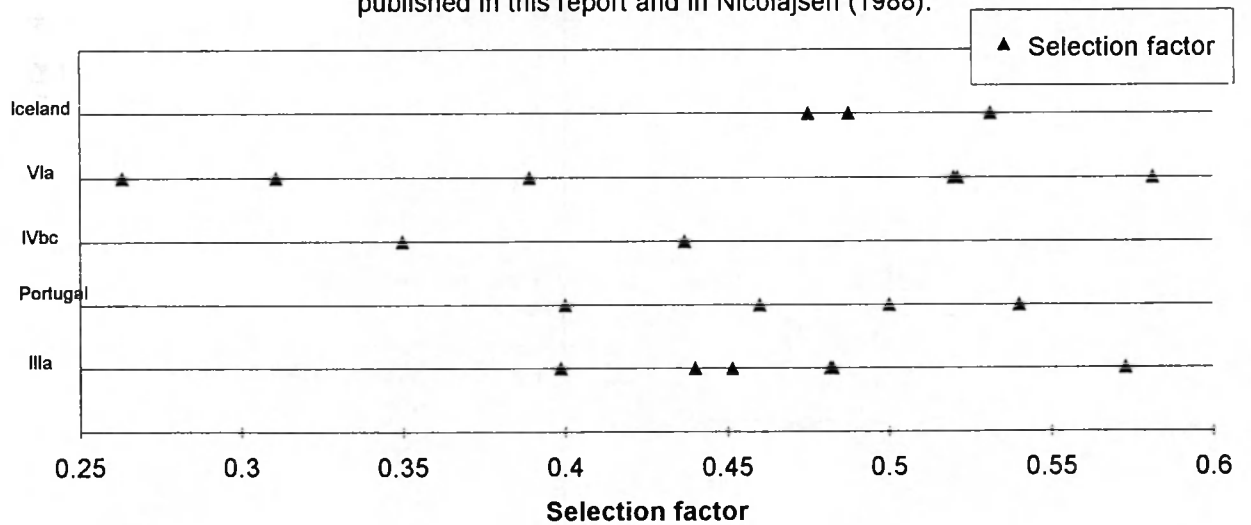


Figure 5.1.1.109

Arrow indicates minimum landing size

Figure 5.1.1.110. : Comparison of historical Nephrops codend selection data published in this report and in Nicolajsen (1988).



Whiting selectivity study
 Numbers of whiting retained
 standard codend (70mm)+ no window

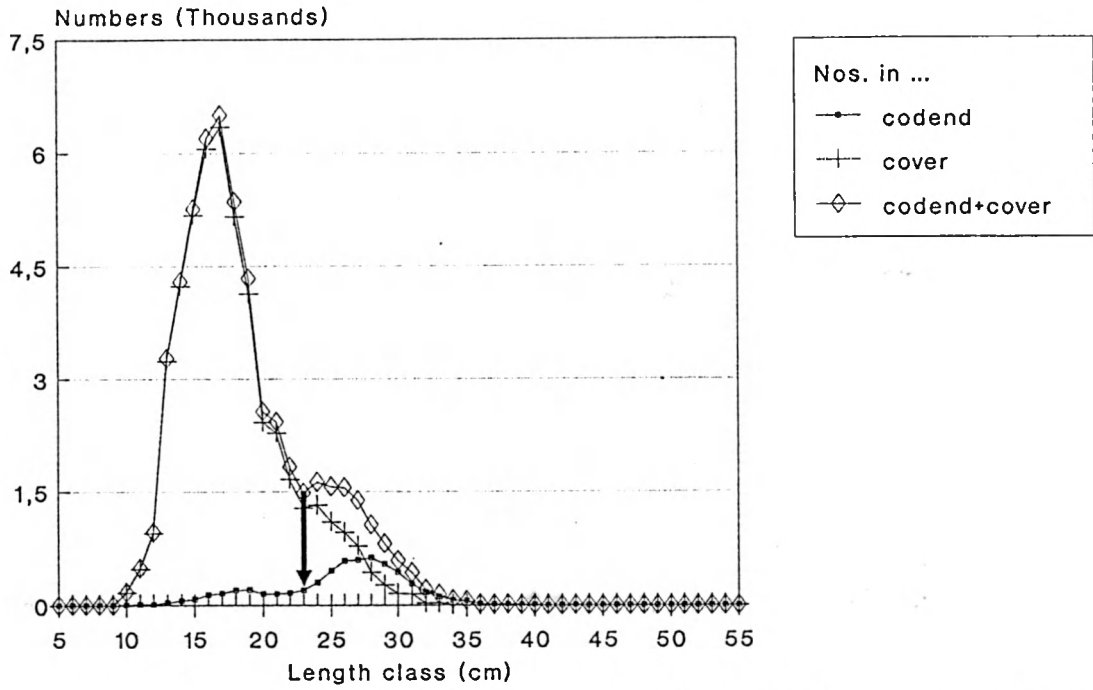


Figure 5.1.2.1.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 standard codend (70mm)+ sq. mesh window

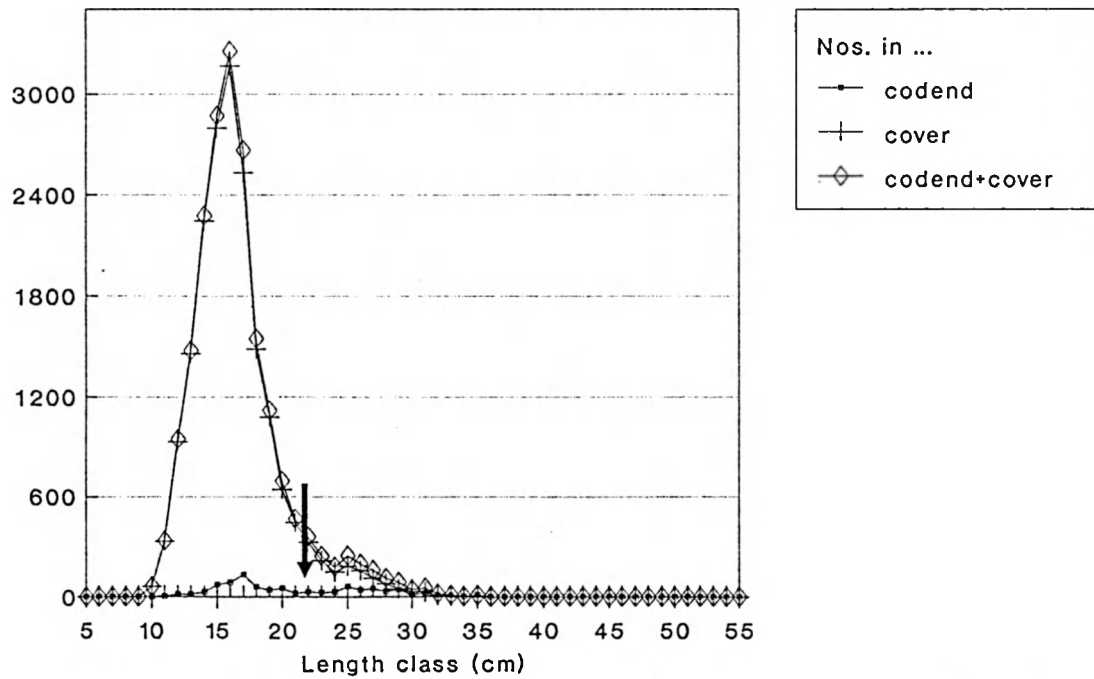


Figure 5.1.2.2.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 90 mm codend

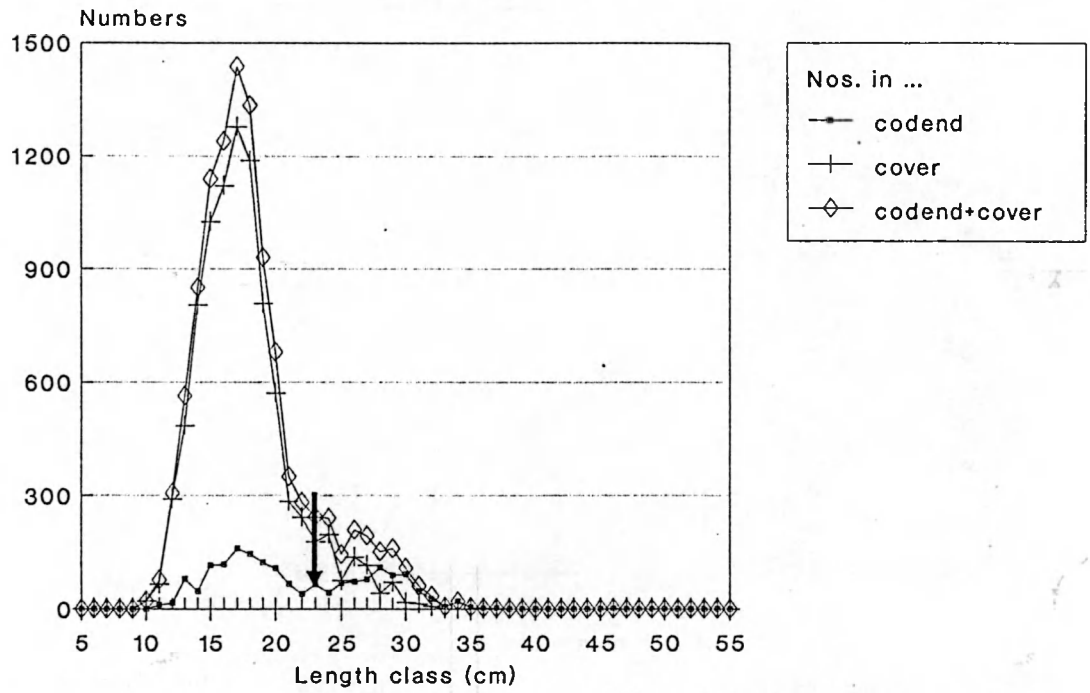


Figure 5.1.2.3.

Arrow indicates minimum landing size

Whiting selectivity study
 Standard codend (70mm) + no window

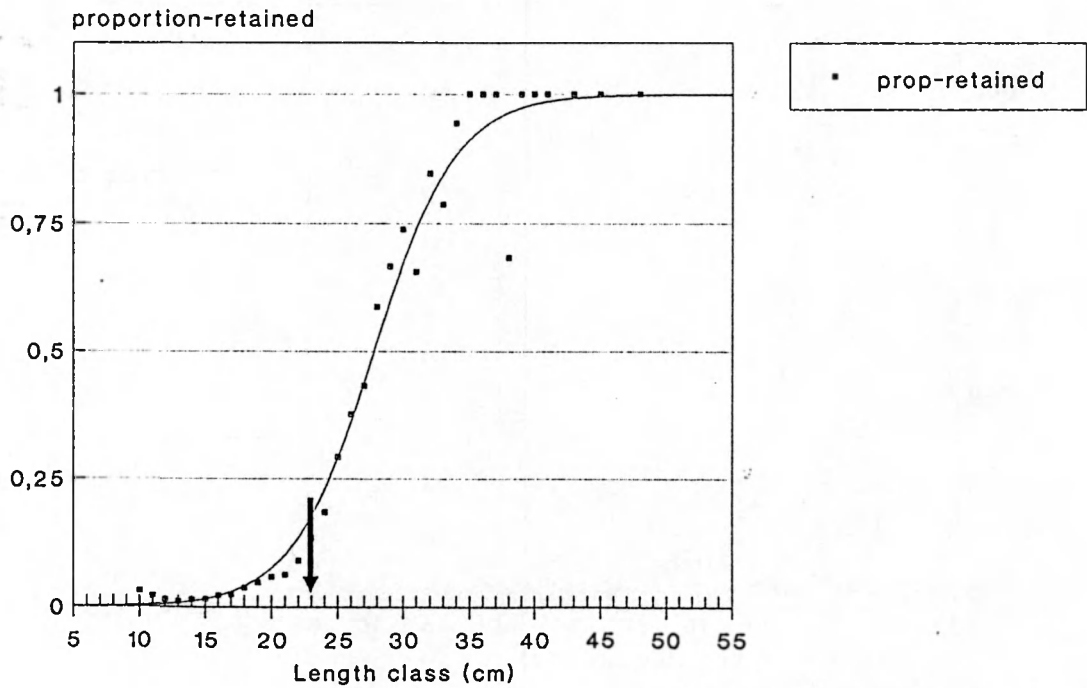


Figure 5.1.2.4.

Arrow indicates minimum landing size

Whiting selectivity study
Standard codend (70mm)+sq. mesh window

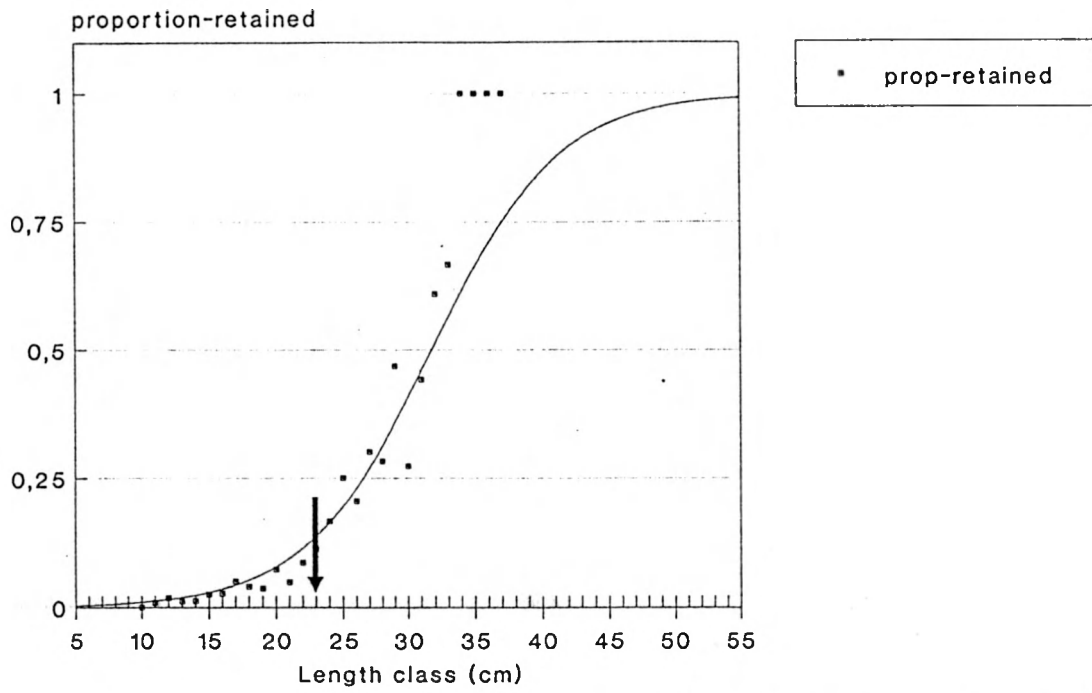


Figure 5.1.2.5.

Arrow indicates minimum landing size

Whiting selectivity study
Standard codend (90mm) + no window

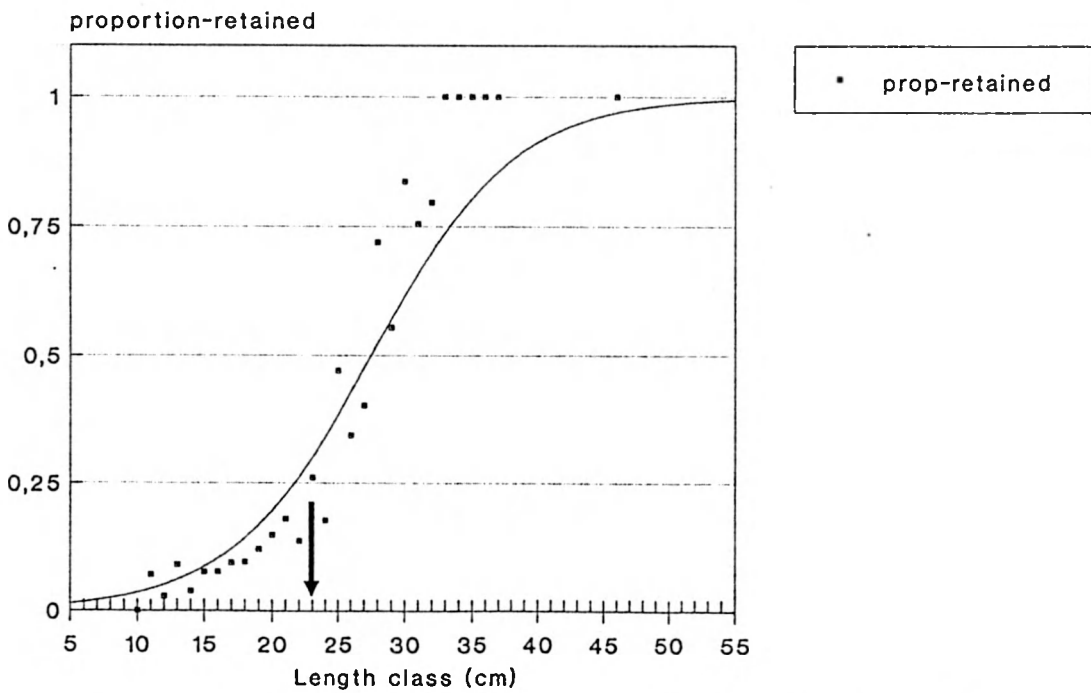
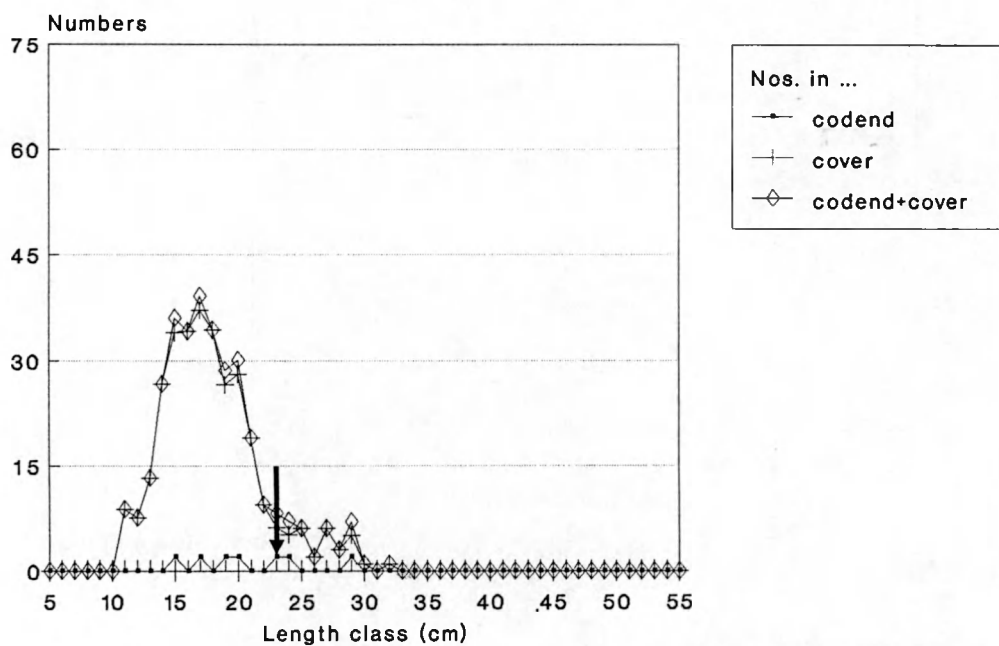


Figure 5.1.2.6.

Arrow indicates minimum landing size

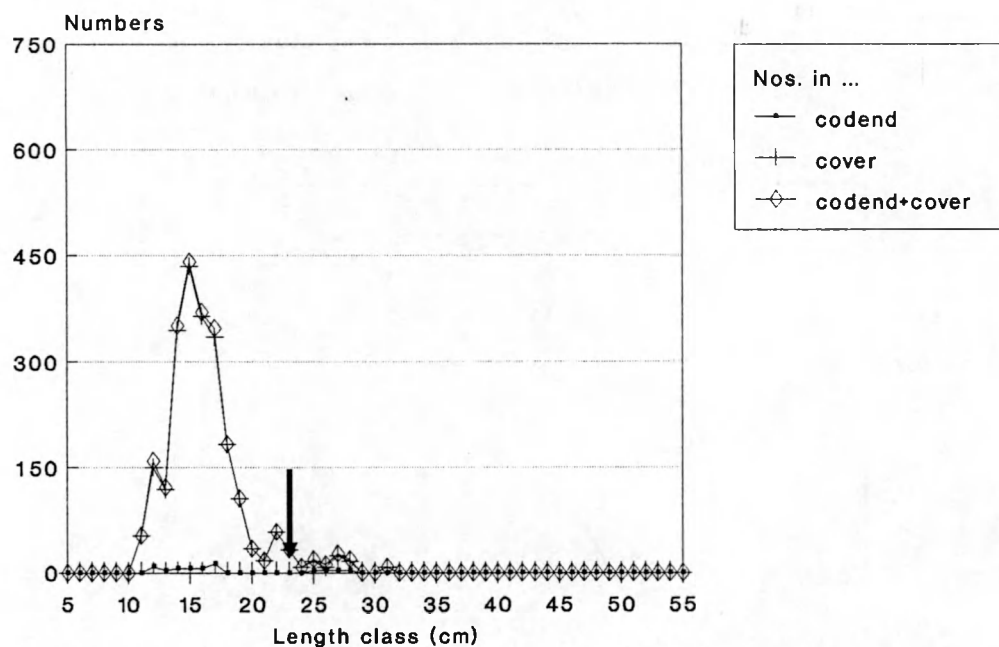
Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 2



Arrow indicates minimum landing size

Figure 5.1.2.7

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 4



Arrow indicates minimum landing size

Figure 5.1.2.8.

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 7

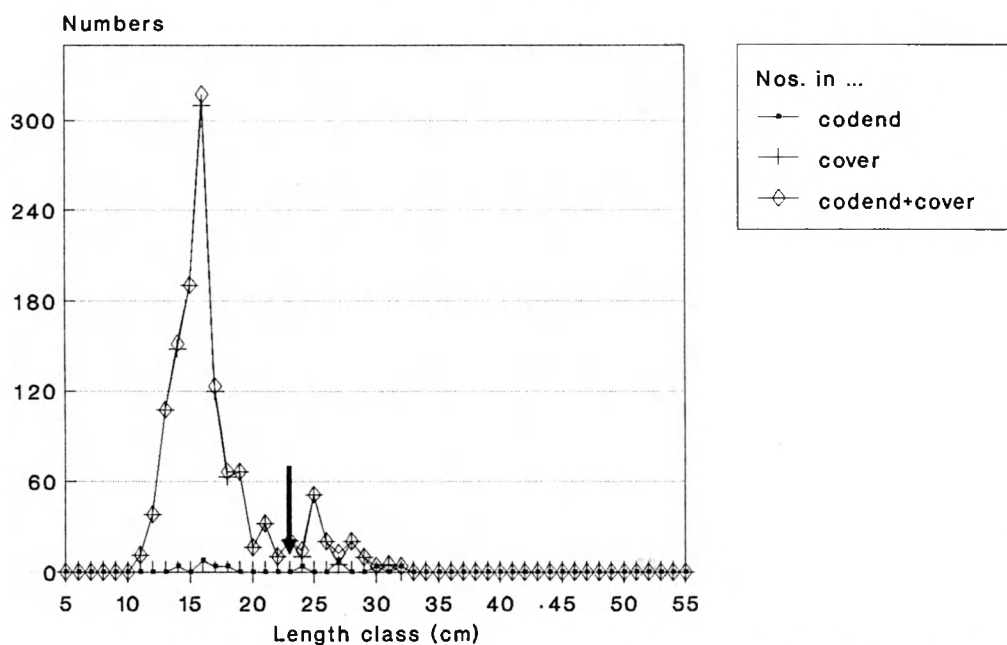


Figure 5.1.2.9. Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 9

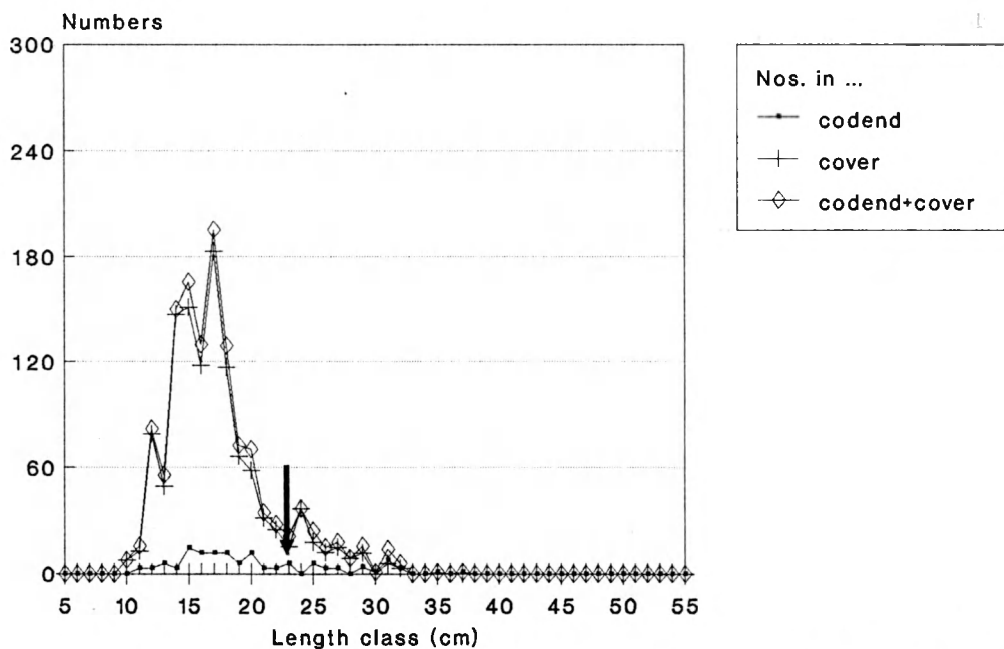


Figure 5.1.2.10. Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 12

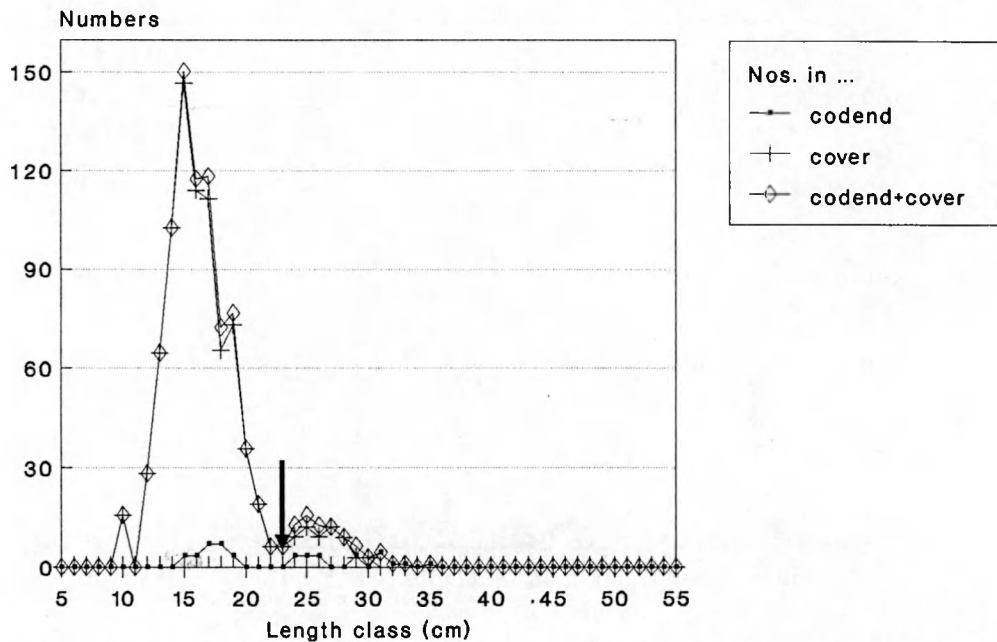


Figure 5.1.2.11.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 13

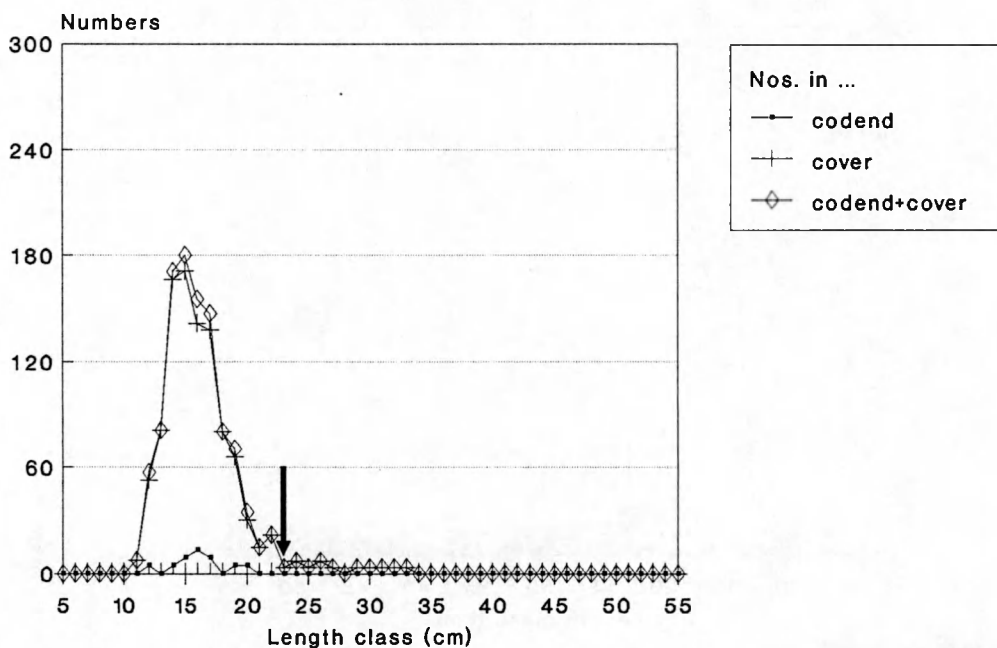


Figure 5.1.2.12.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 15

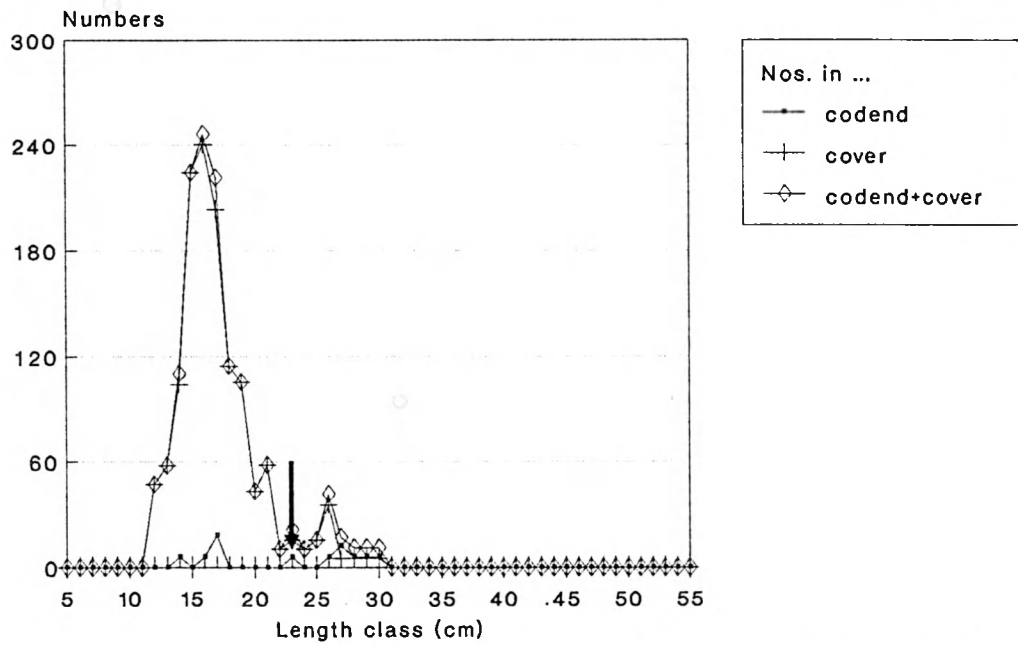


Figure 5.1.2.13.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 18

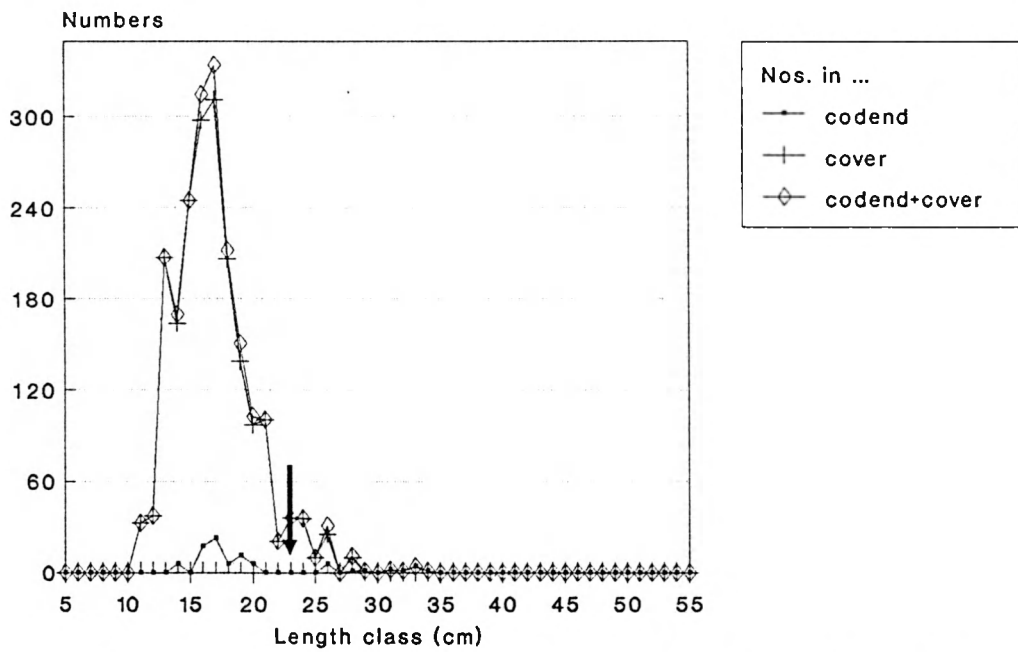


Figure 5.1.2.14.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 19

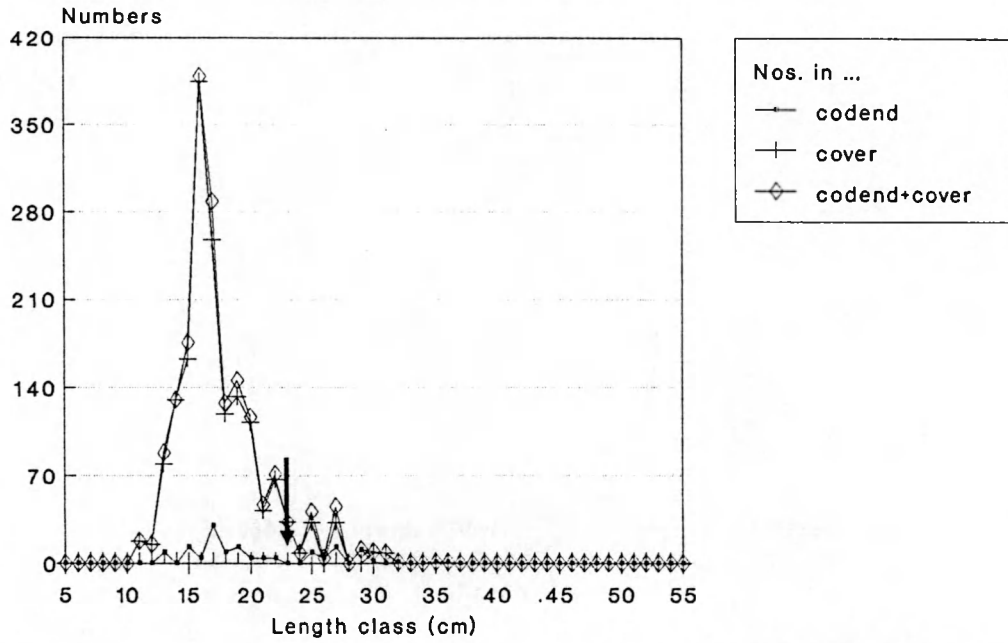


Figure 5.1.2.15.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 20

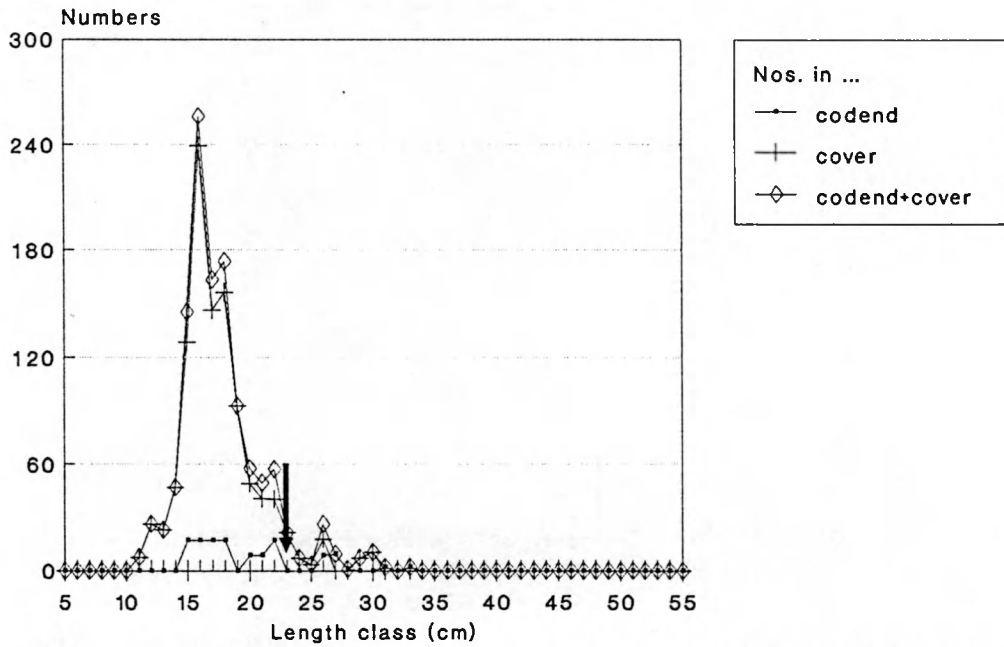
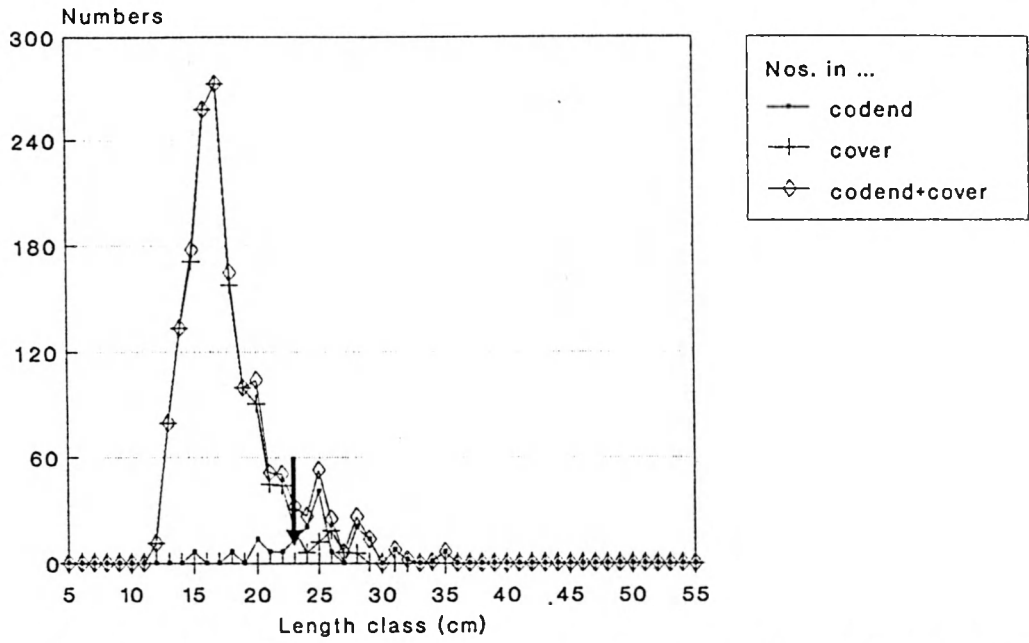


Figure 5.1.2.16.

Arrow indicates minimum landing size

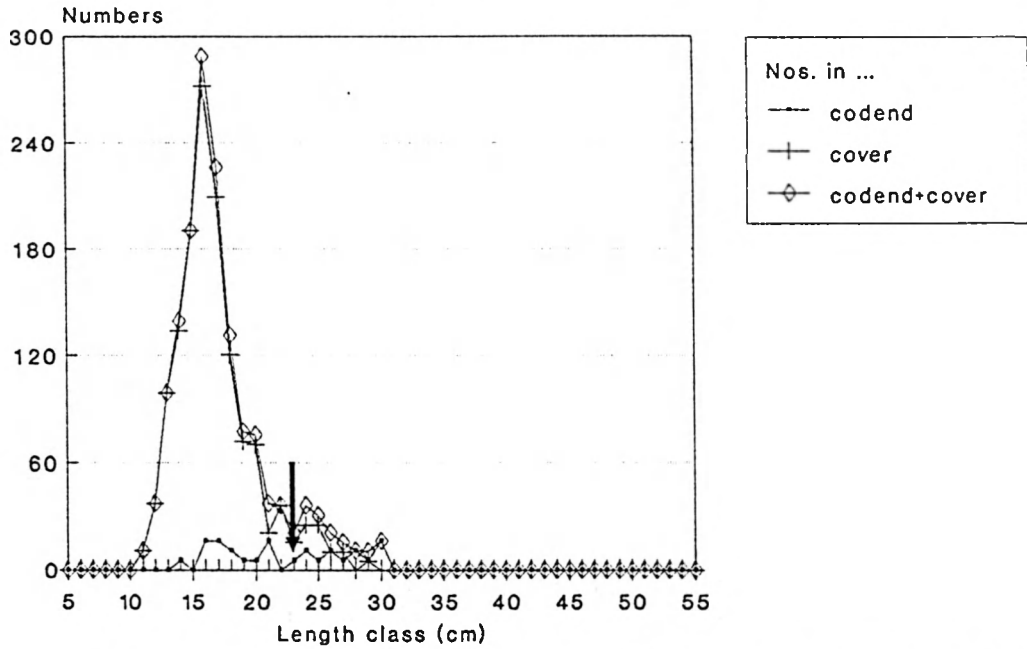
Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 21



Arrow indicates minimum landing size

Figure 5.1.2.17.

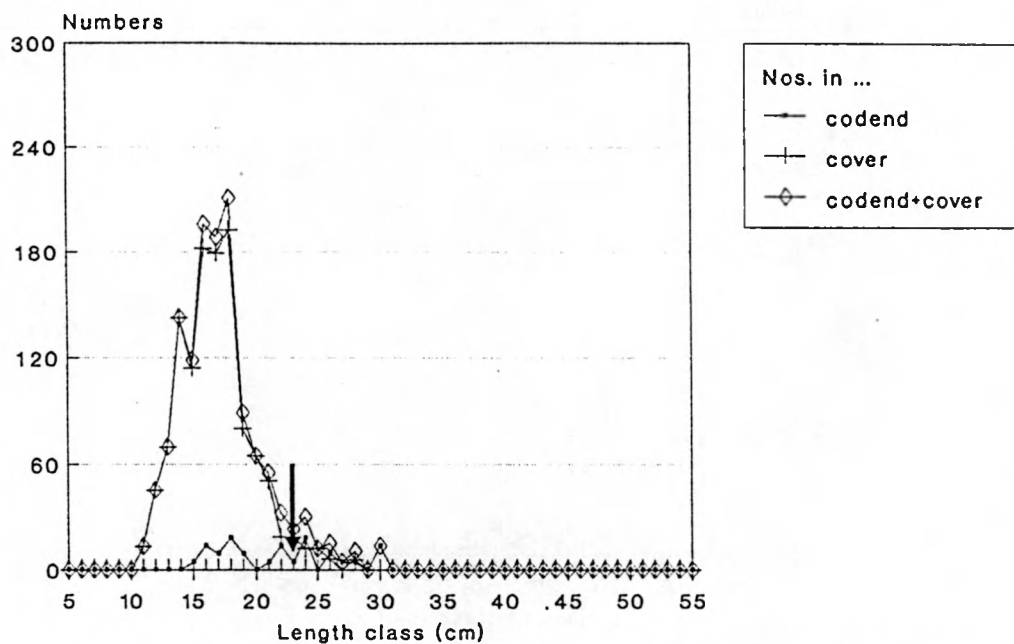
Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 23



Arrow indicates minimum landing size

Figure 5.1.2.18

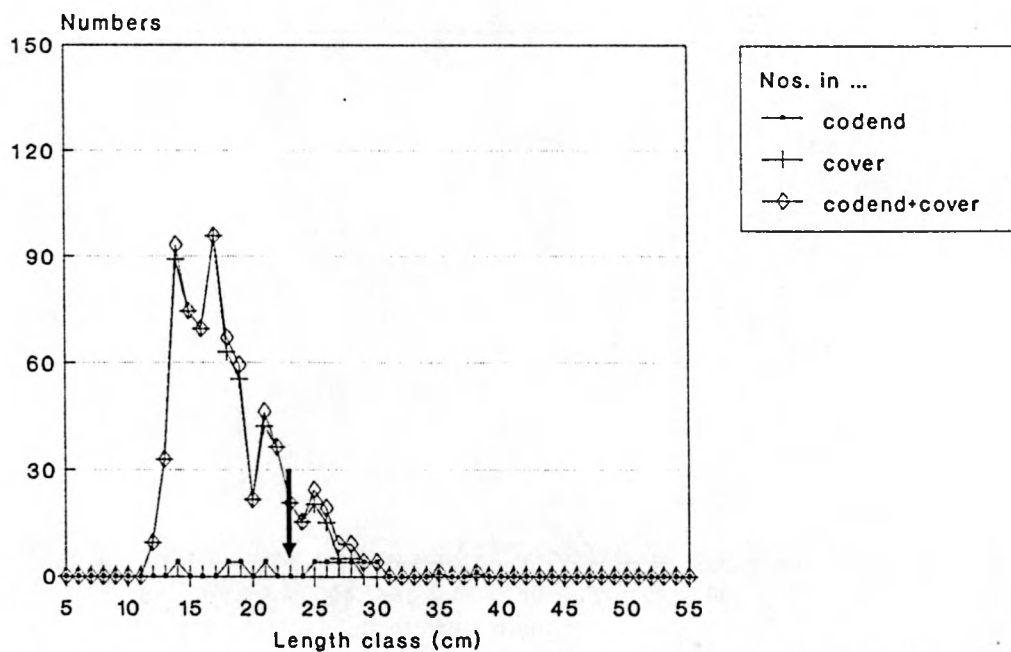
Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 24



Arrow indicates minimum landing size

Figure 5.1.2.19.

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 25



Arrow indicates minimum landing size

Figure 5.1.2.20.

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 29

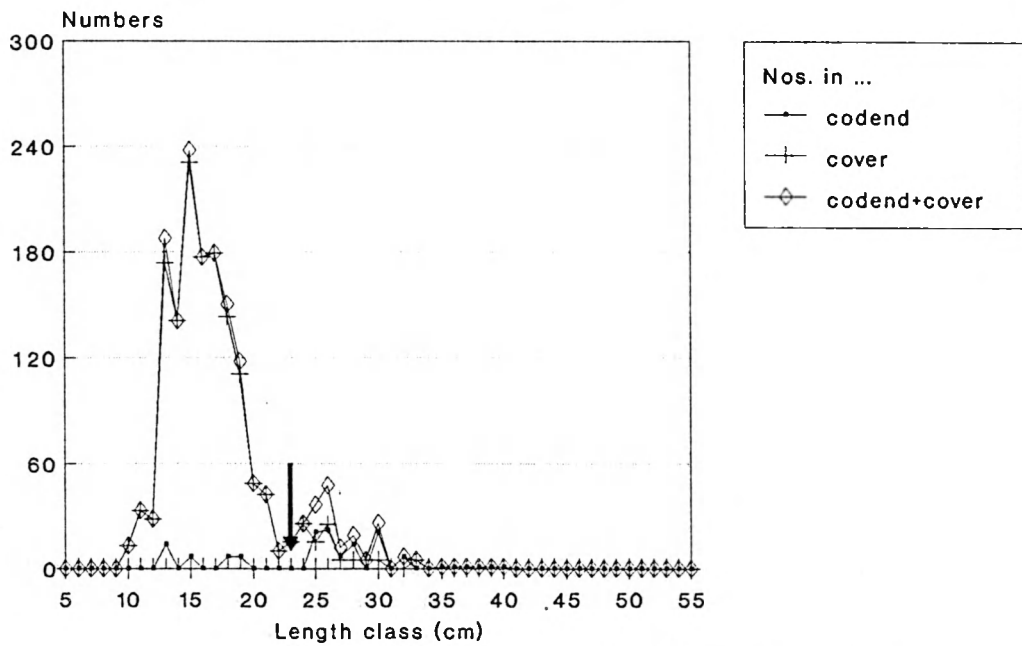


Figure 5.1.2.21.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 31

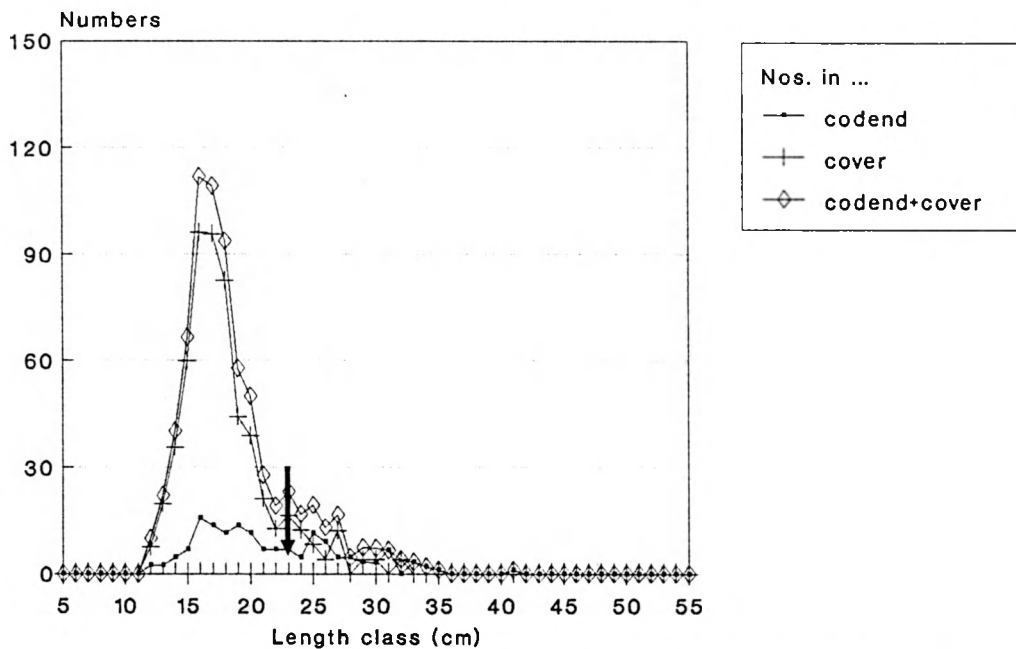


Figure 5.1.2.22.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 32

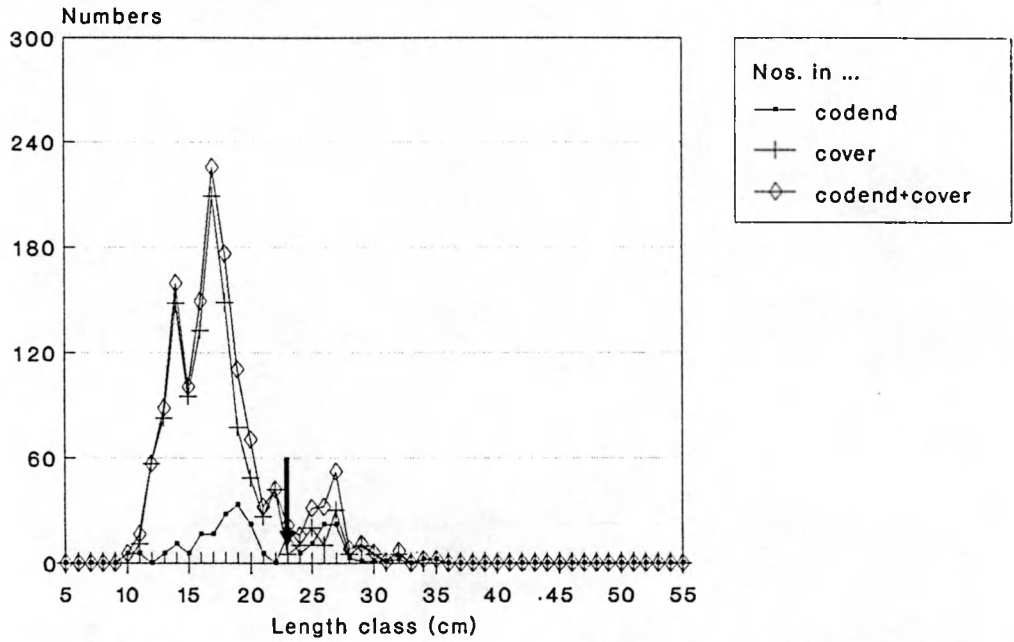


Figure 5.1.2.23.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 39

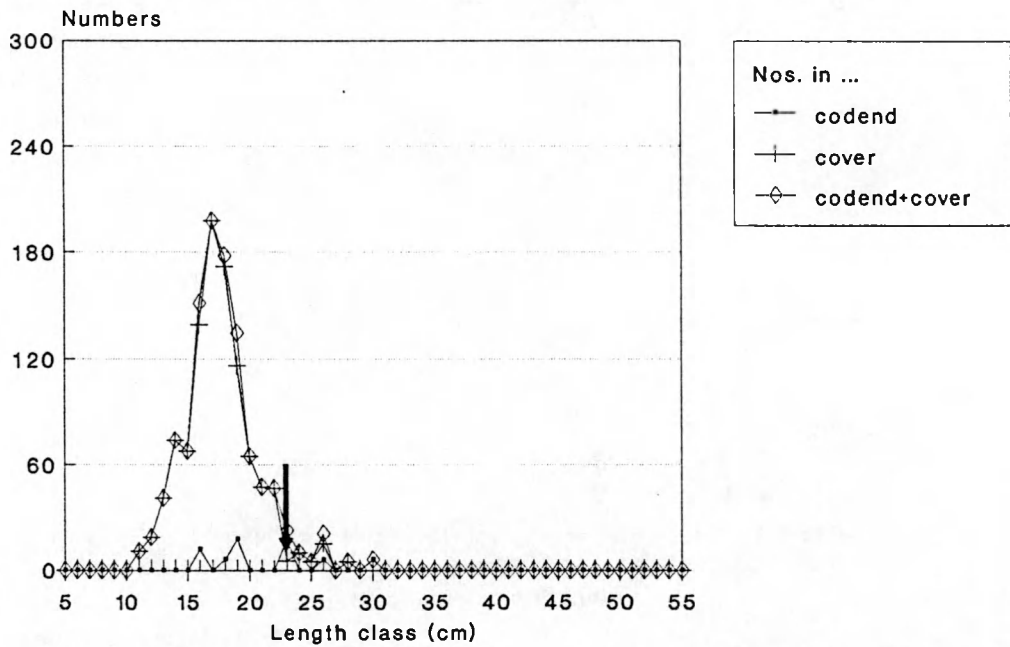


Figure 5.1.2.24.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 41

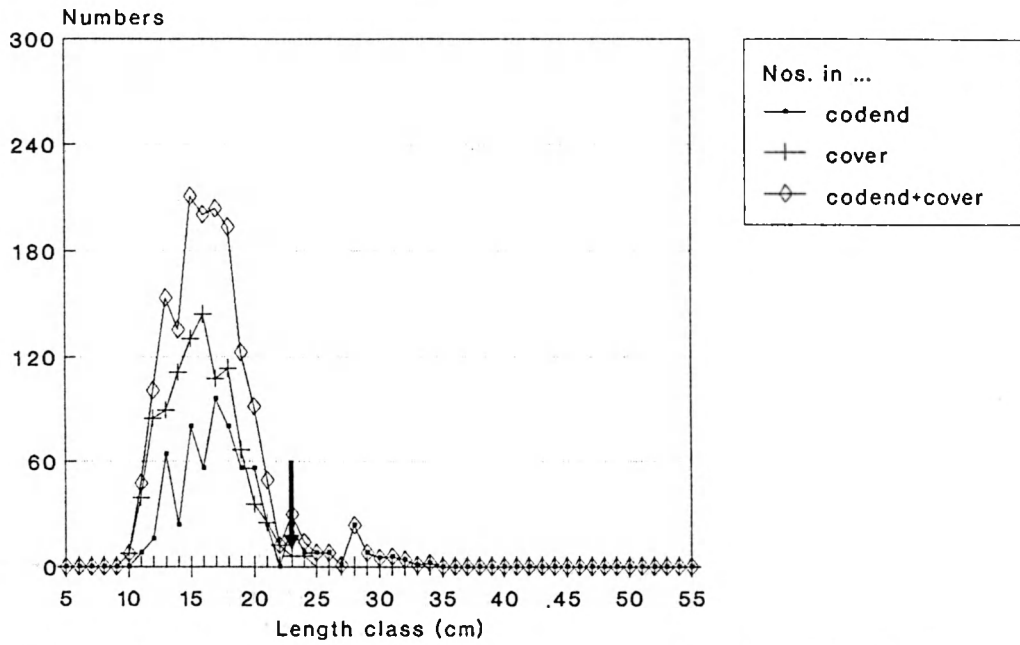


Figure 5.1.2.25.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 42

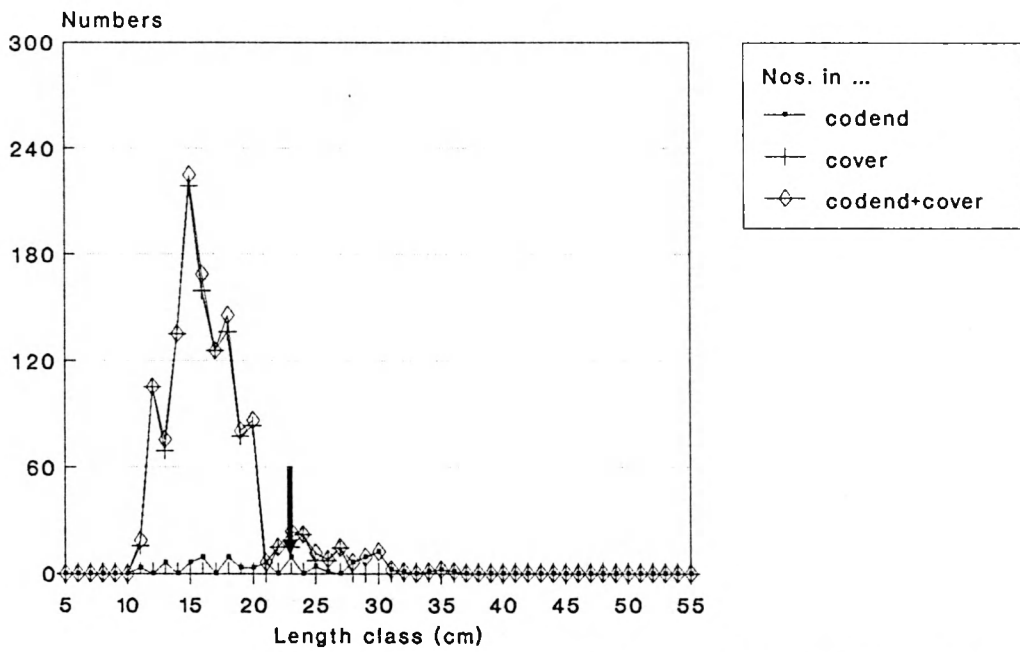


Figure 5.1.2.26.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 43

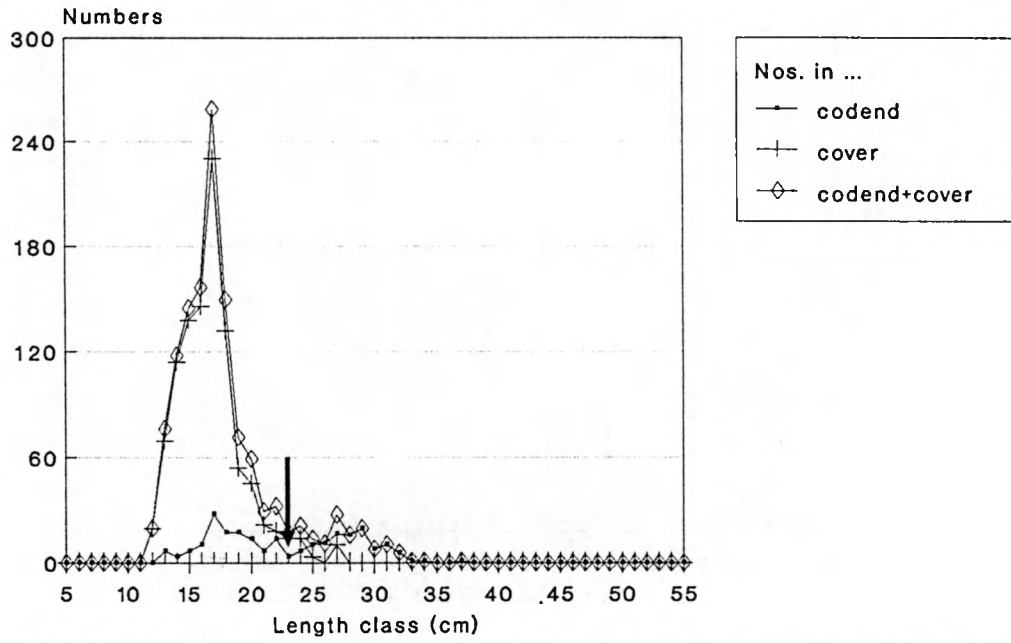


Figure 5.1.2.27.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 47

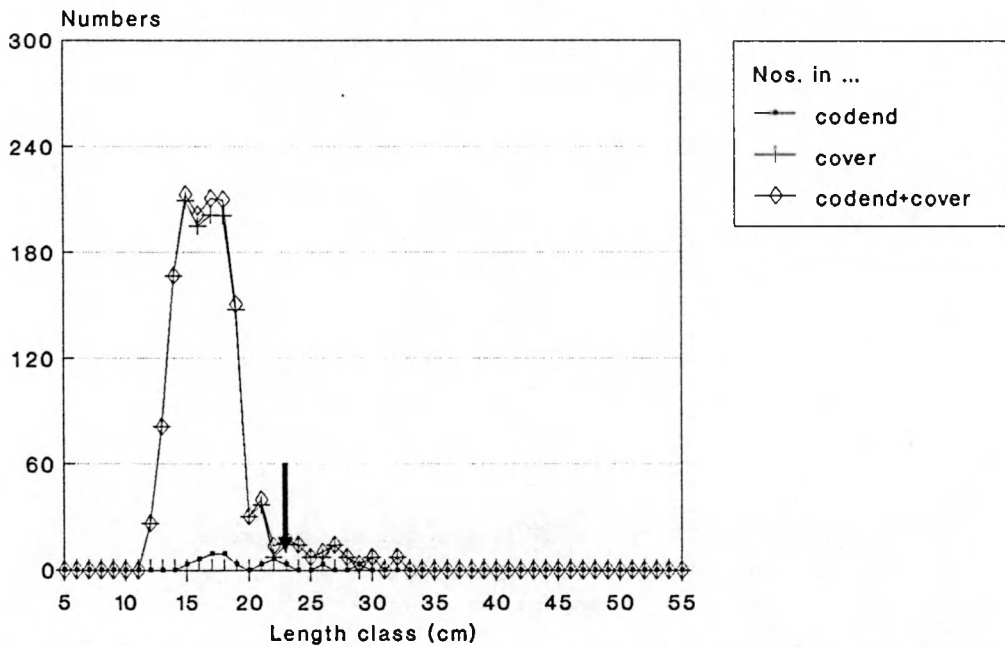
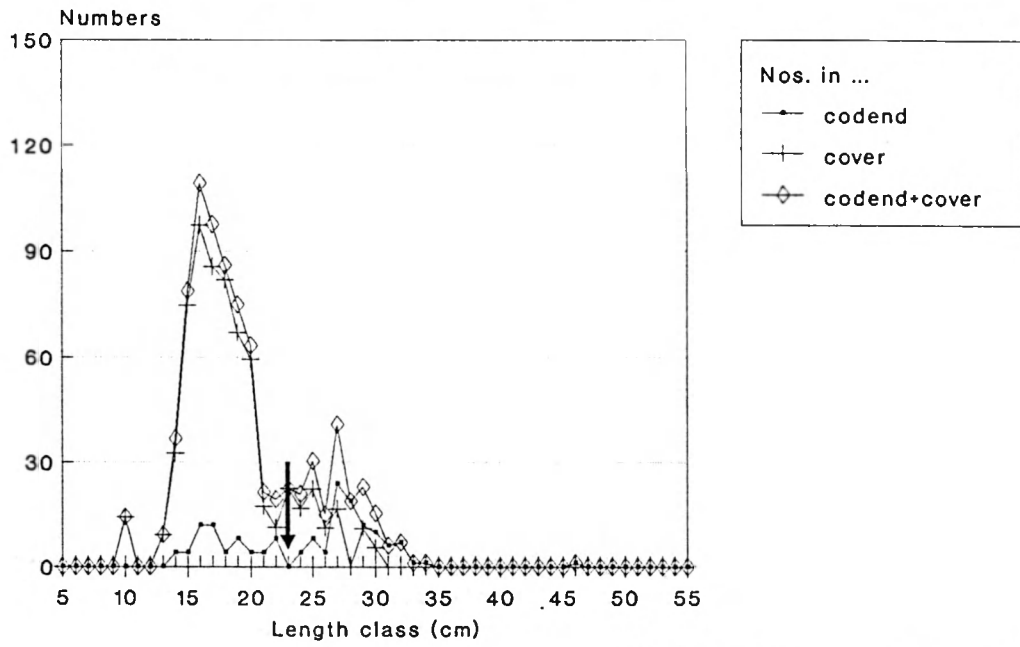


Figure 5.1.2.28

Arrow indicates minimum landing size

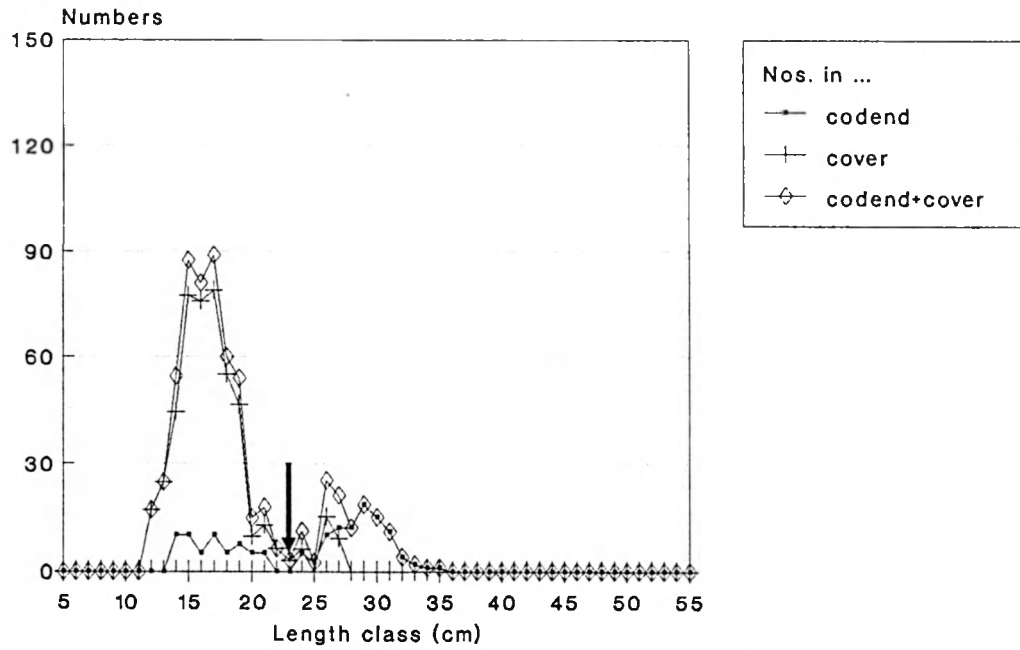
Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 49



Arrow indicates minimum landing size

Figure 5.1.2.29.

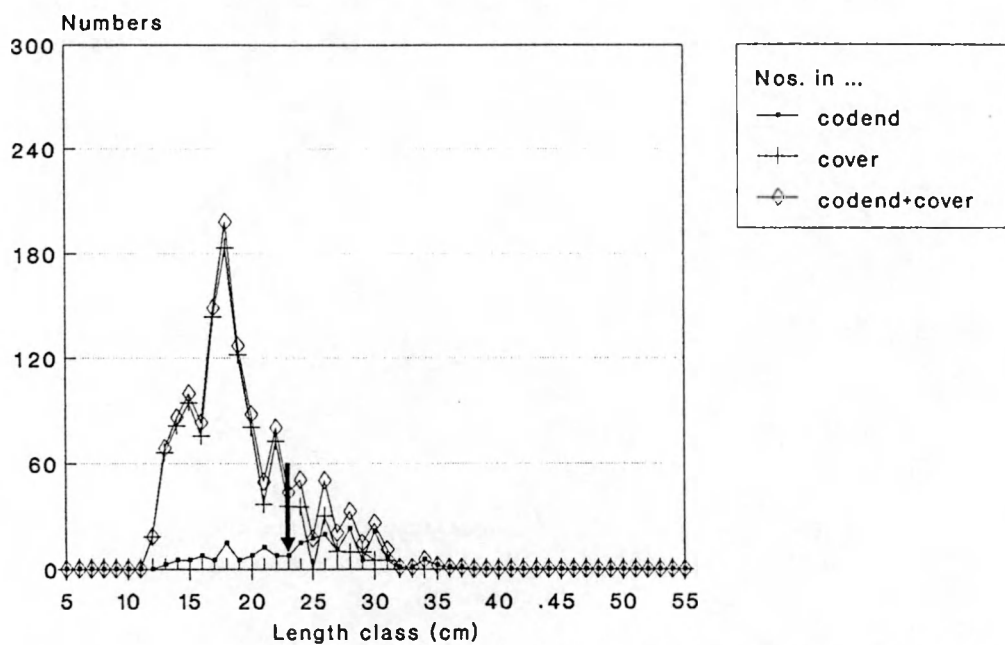
Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 50



Arrow indicates minimum landing size

Figure 5.1.2.30.

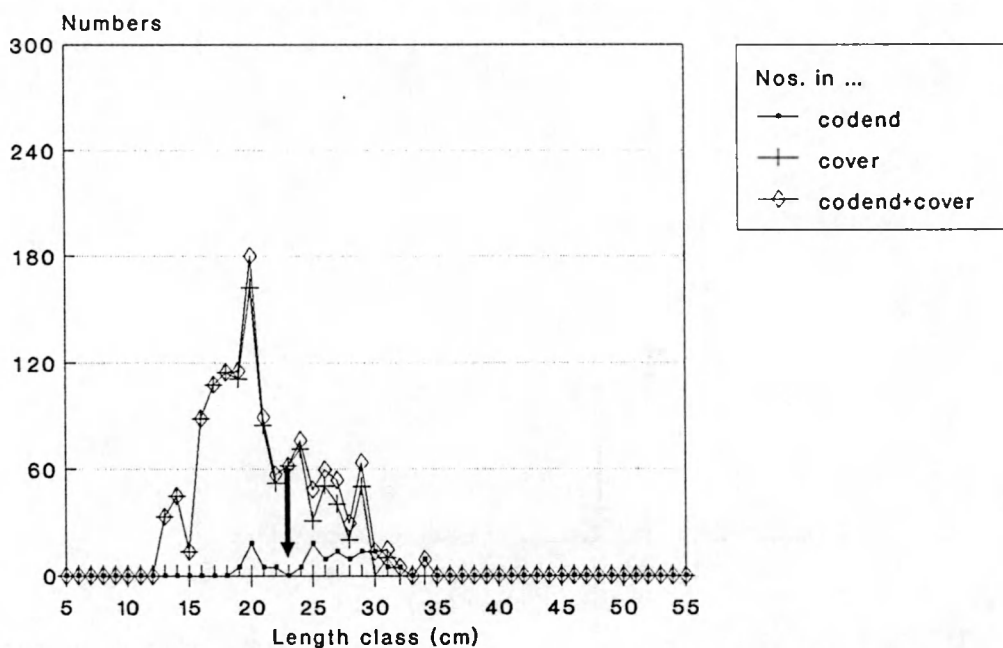
Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 51



Arrow indicates minimum landing size

Figure 5.1.2.31.

Whiting selectivity study
 Numbers of whiting retained
 Campaign 1 : Haul 52



Arrow indicates minimum landing size

Figure 5.1.2.32.

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 25

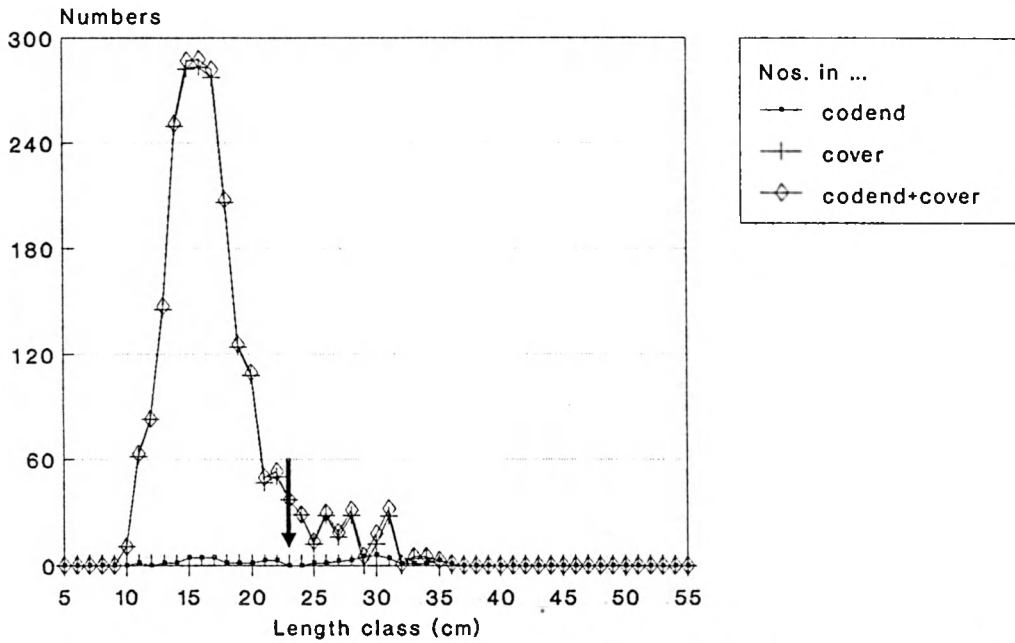


Figure 5.1.2.33.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 27

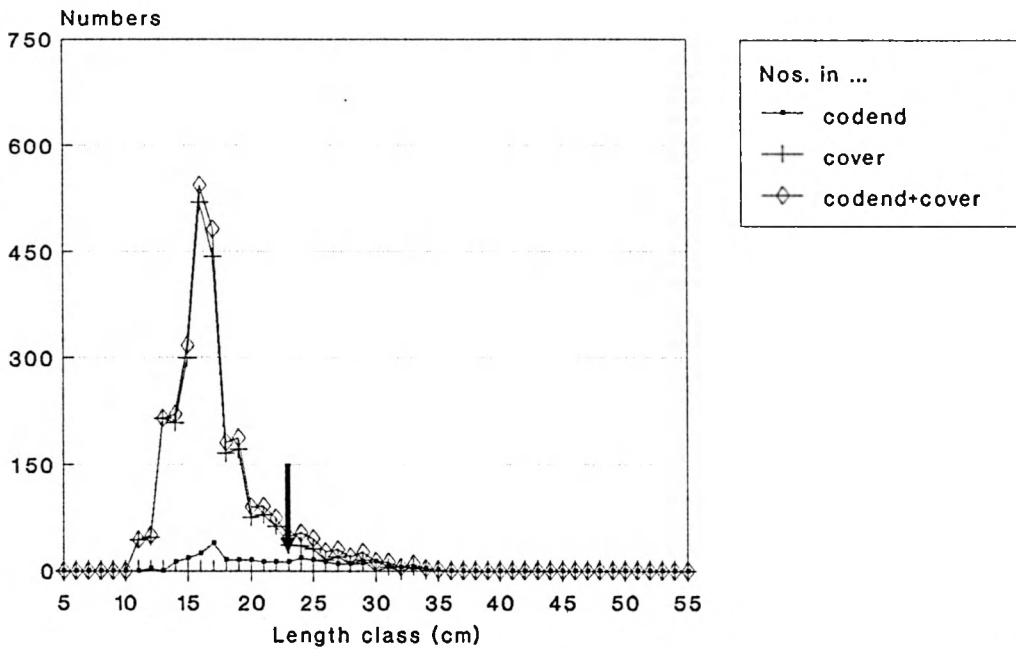


Figure 5.1.2.34.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 30

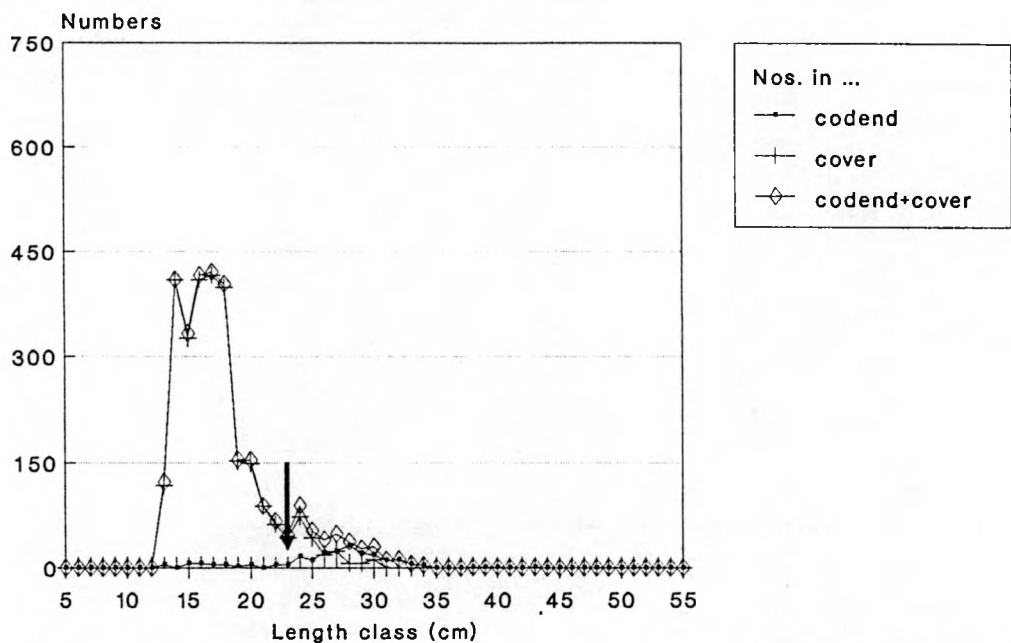


Figure 5.1.2.35. Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 32

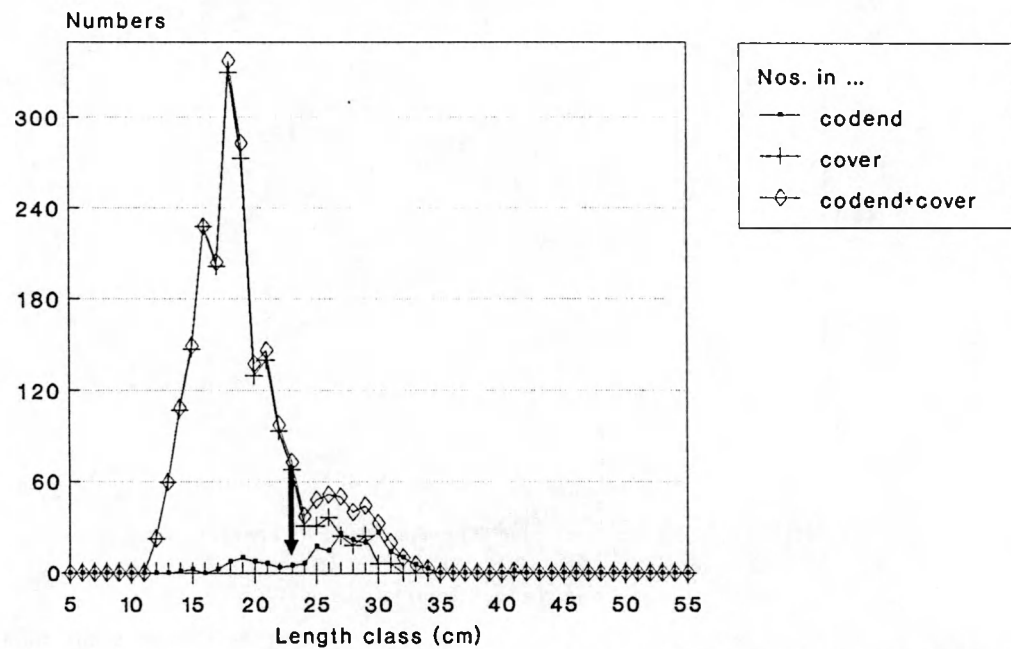


Figure 5.1.2.36. Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 35

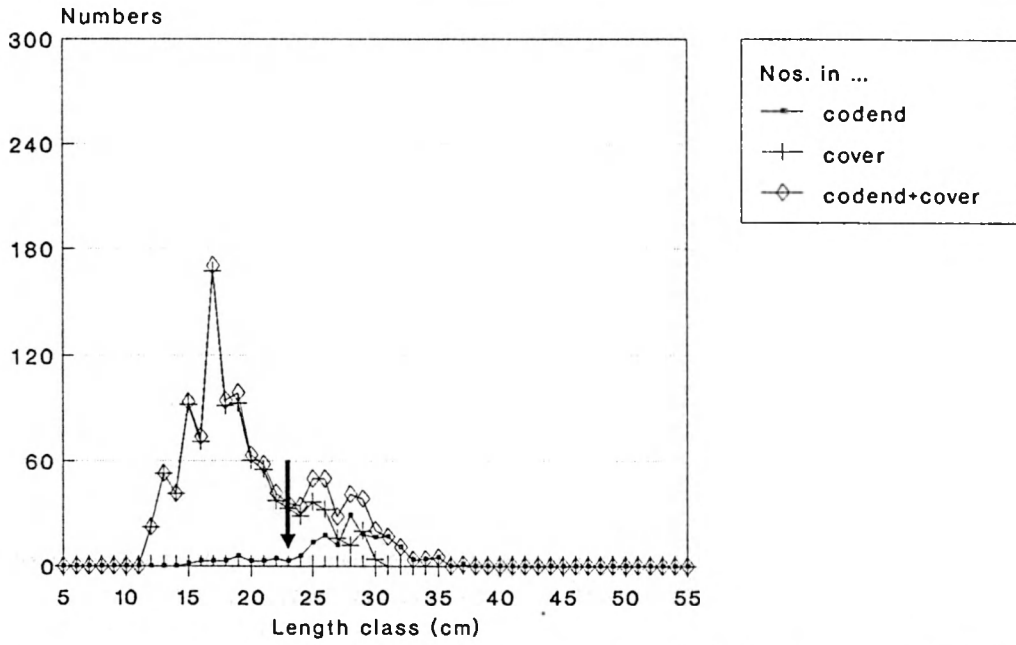


Figure 5.1.2.37.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 36

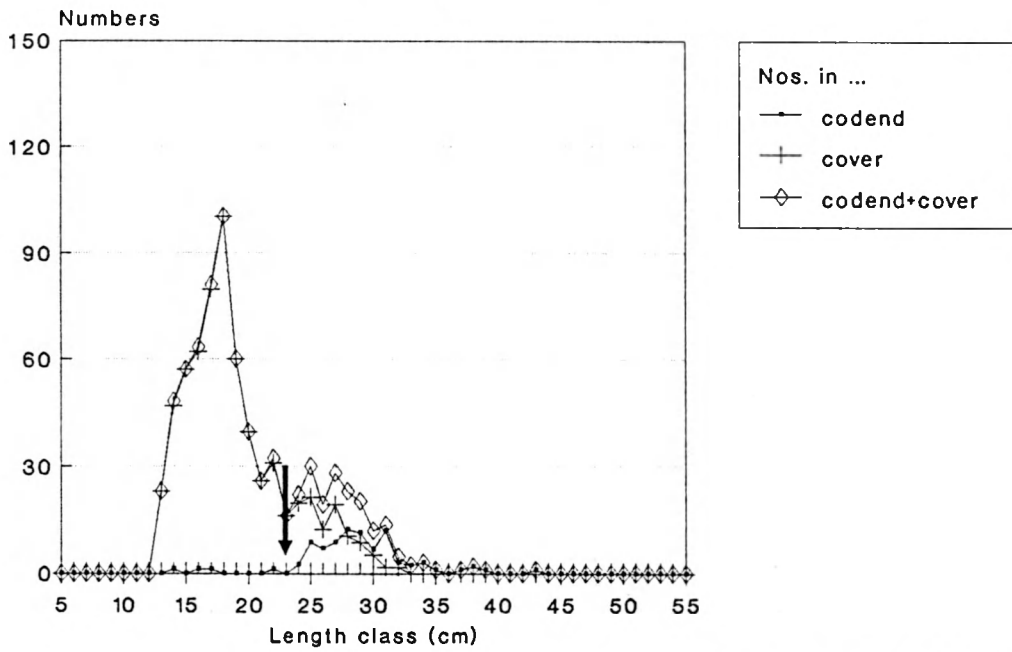


Figure 5.1.2.38.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 37

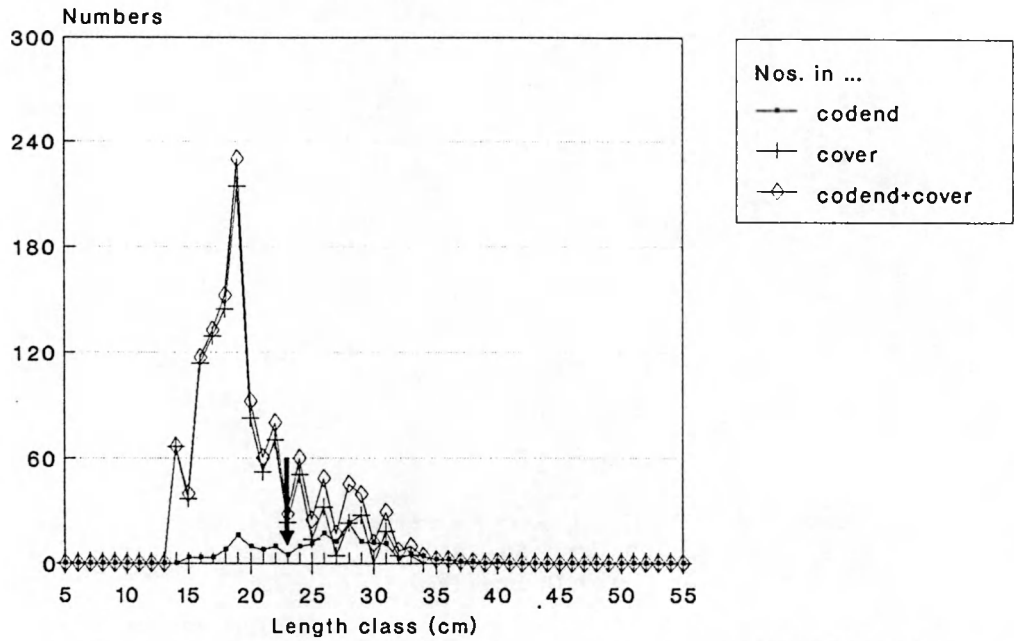


Figure 5.1.2.39.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 40

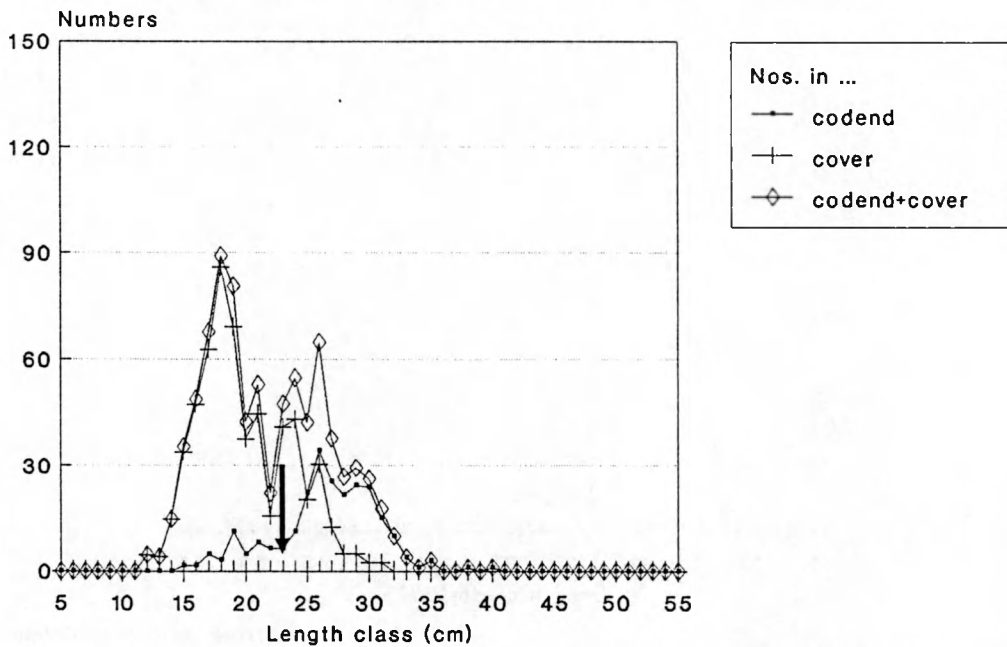


Figure 5.1.2.40.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 41

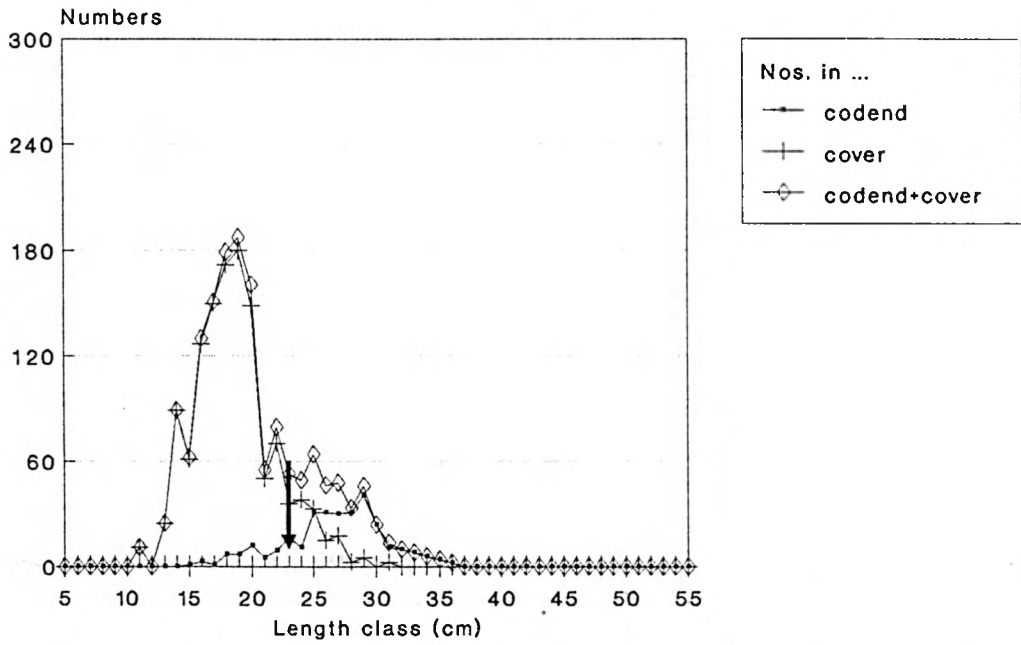


Figure 5.1.2.41.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 42

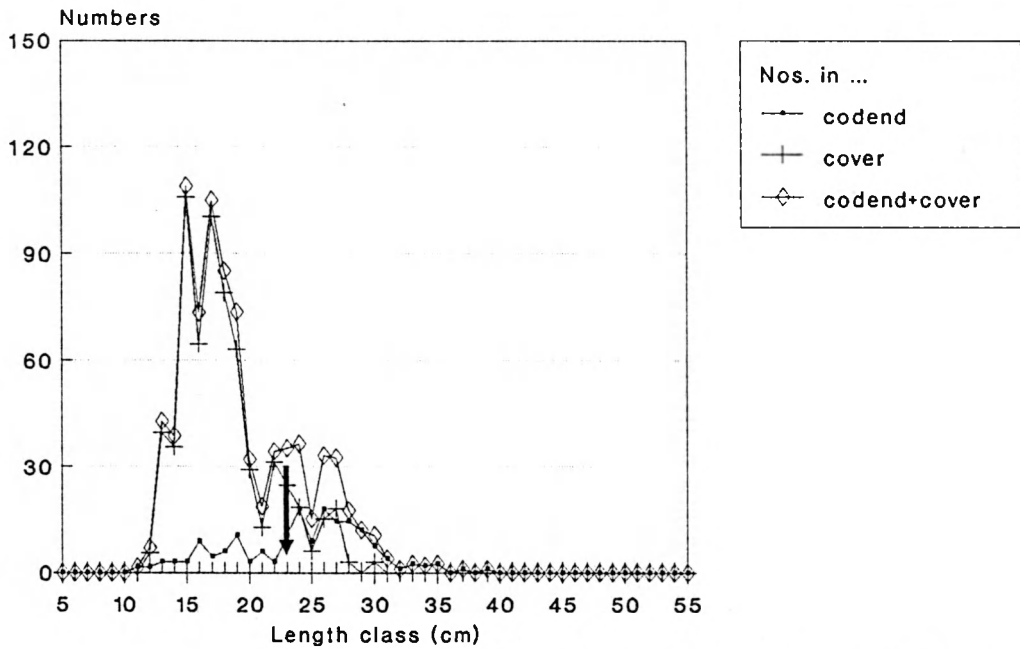
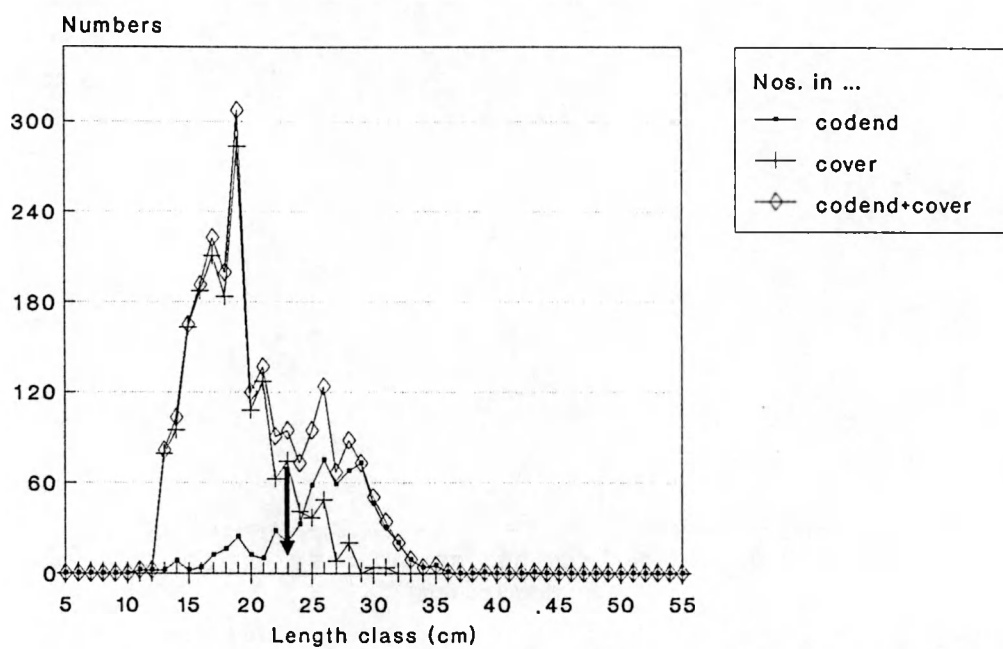


Figure 5.1.2.42.

Arrow indicates minimum landing size

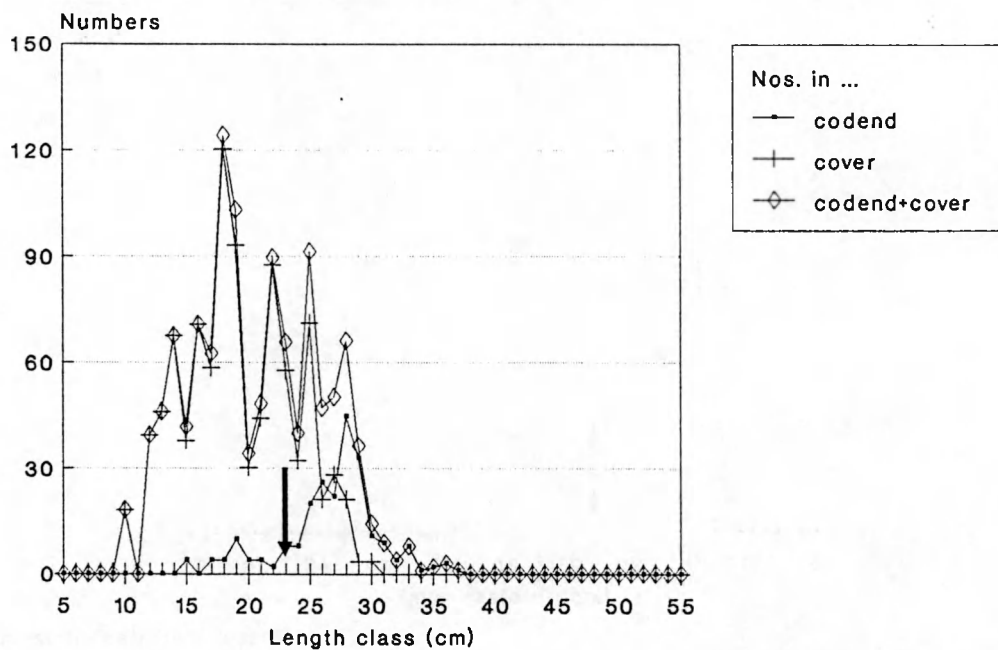
Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 45



Arrow indicates minimum landing size

Figure 5.1.2.43.

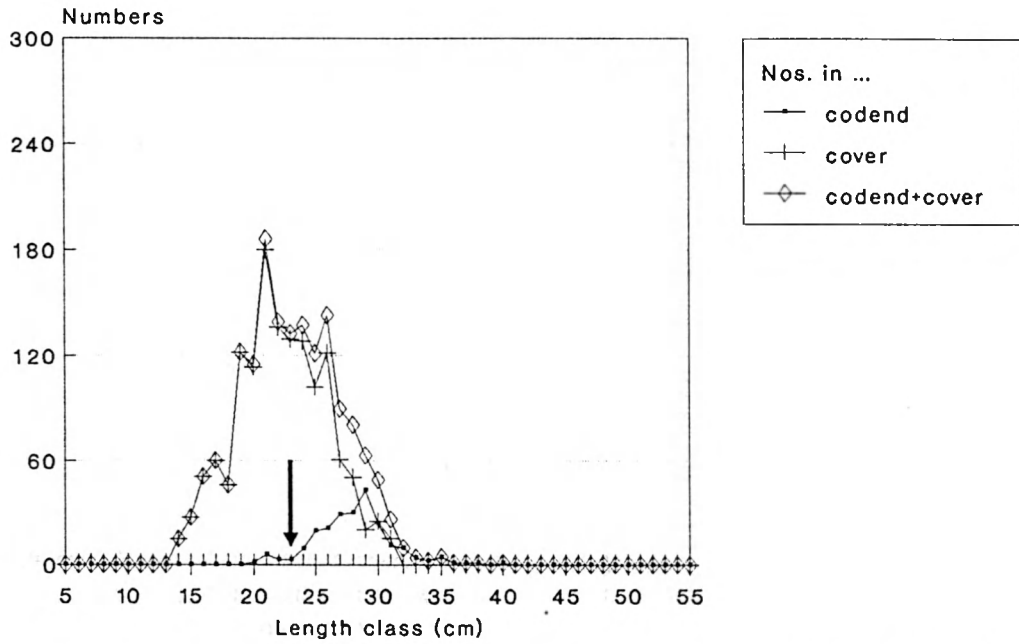
Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 47



Arrow indicates minimum landing size

Figure 5.1.2.44.

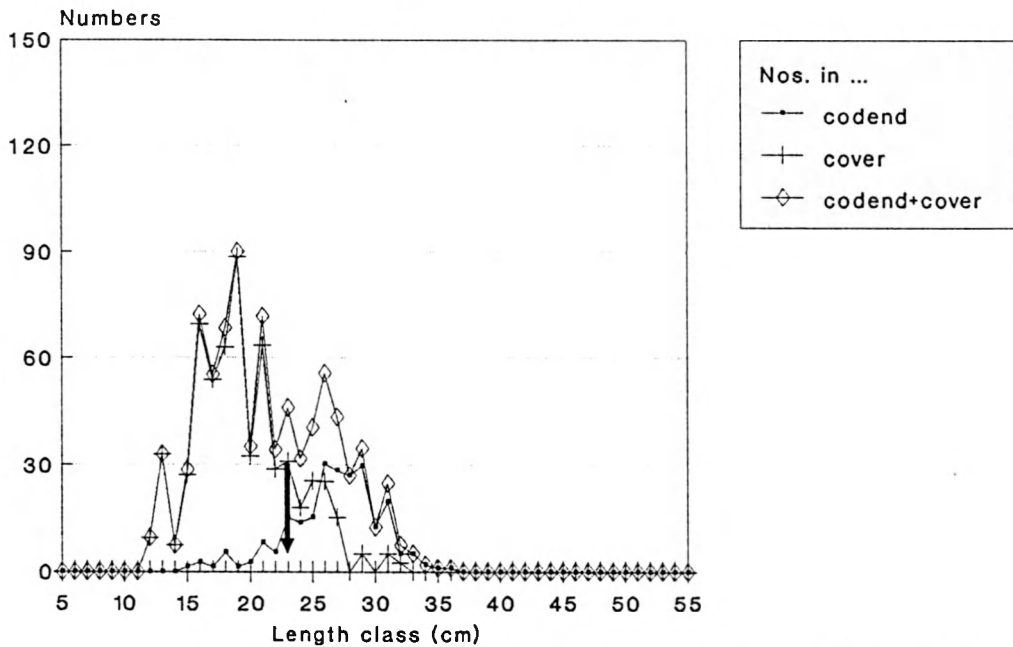
Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 48



Arrow indicates minimum landing size

Figure 5.1.2.45.

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 49



Arrow indicates minimum landing size

Figure 5.1.2.46.

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 51

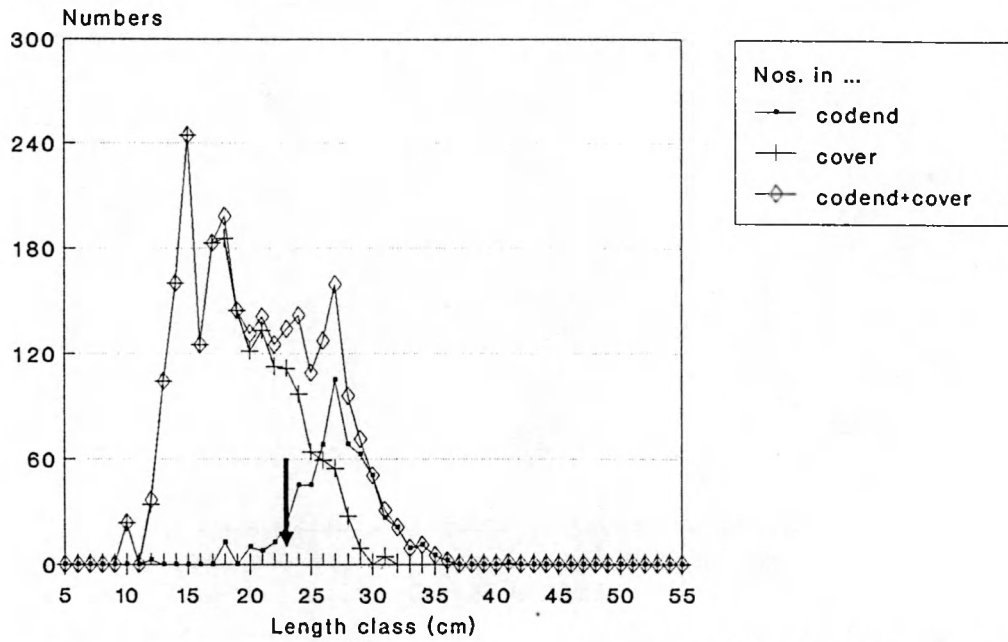


Figure 5.1.2.47.

Arrow indicates minimum landing size

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 52

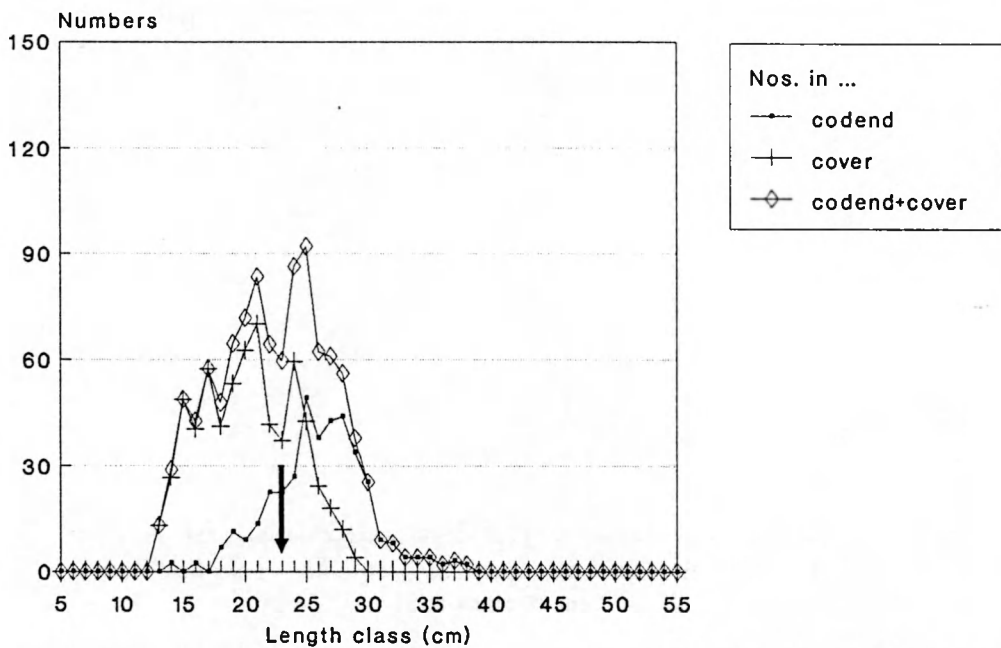
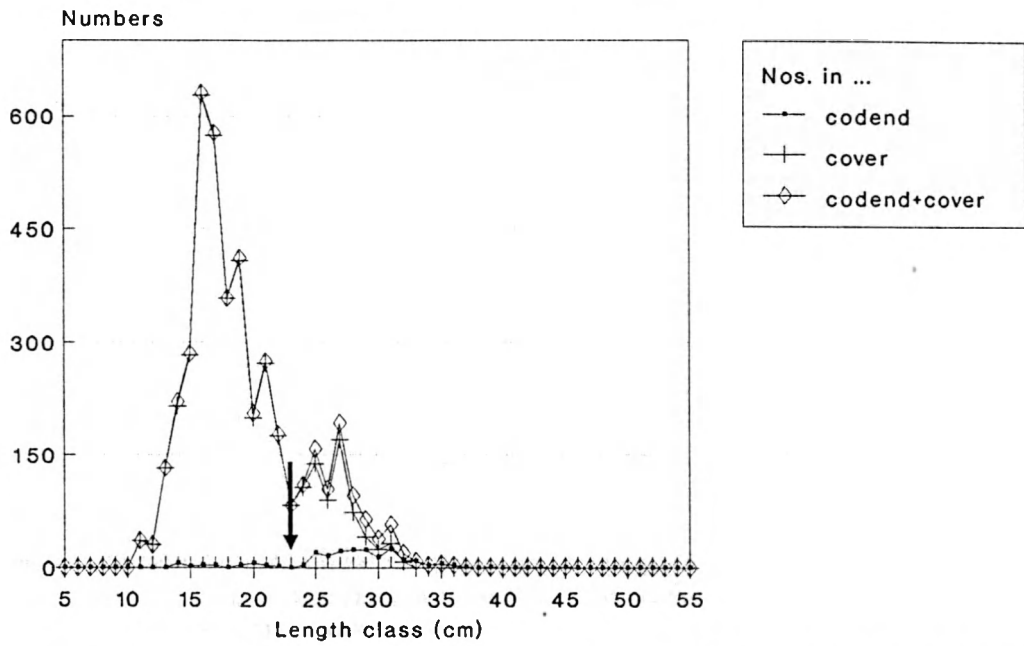


Figure 5.1.2.48.

Arrow indicates minimum landing size

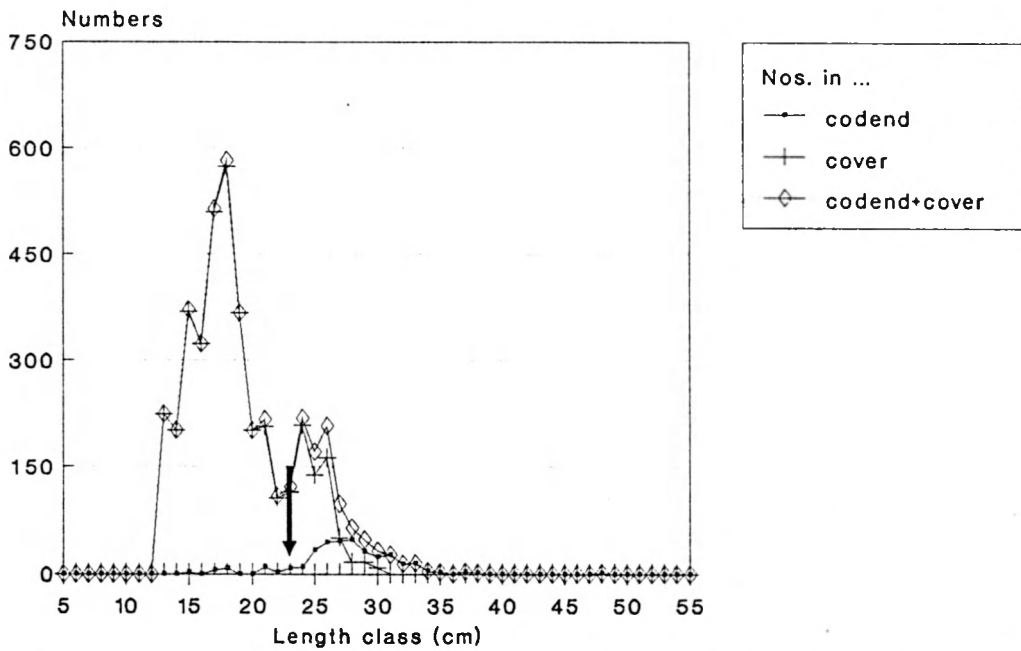
Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 54



Arrow indicates minimum landing size

Figure 5.1.2.49.

Whiting selectivity study
 Numbers of whiting retained
 Campaign 2 : Haul 55



Arrow indicates minimum landing size

Figure 5.1.2.50.

Whiting selectivity study
Numbers of whiting retained
Campaign 2 : Haul 57

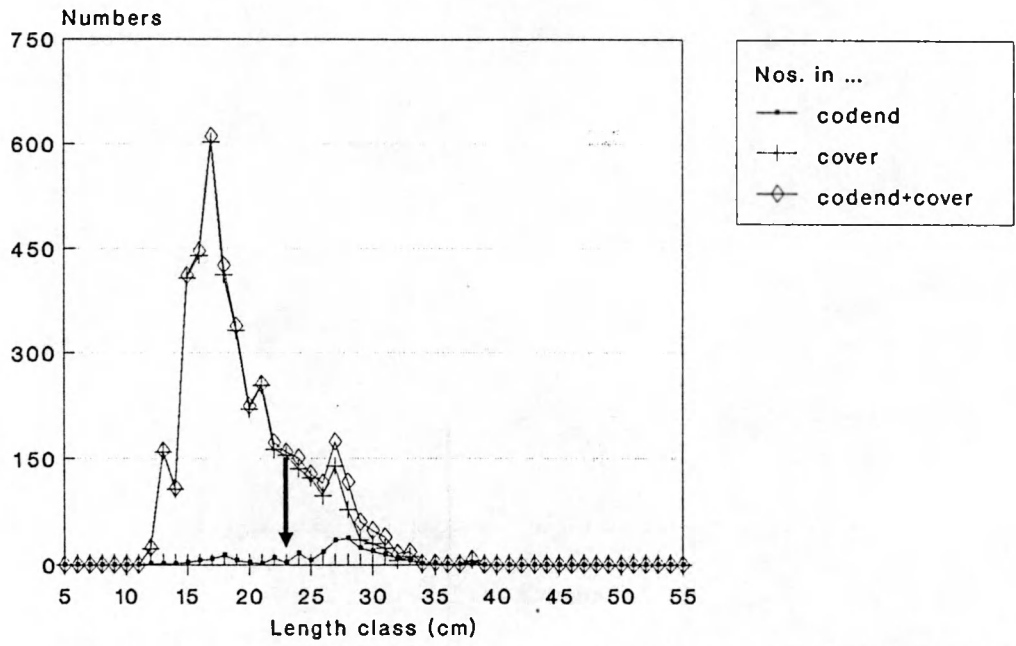


Figure 5.1.2.51.

Arrow indicates minimum landing size

Nephrops landings and discards
 Numbers discarded/landed per day
 All campaigns : All data sets : Mal+Fem

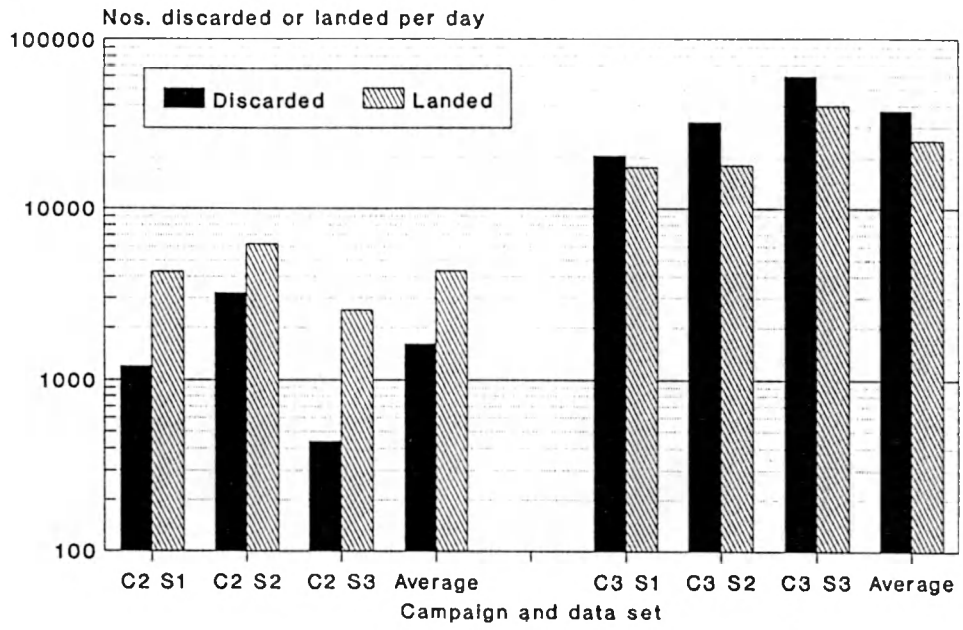


Figure 5.2.1.1.

Nephrops discards study
 Numbers caught per day
 Campaign 2 : Data set 1 : Males

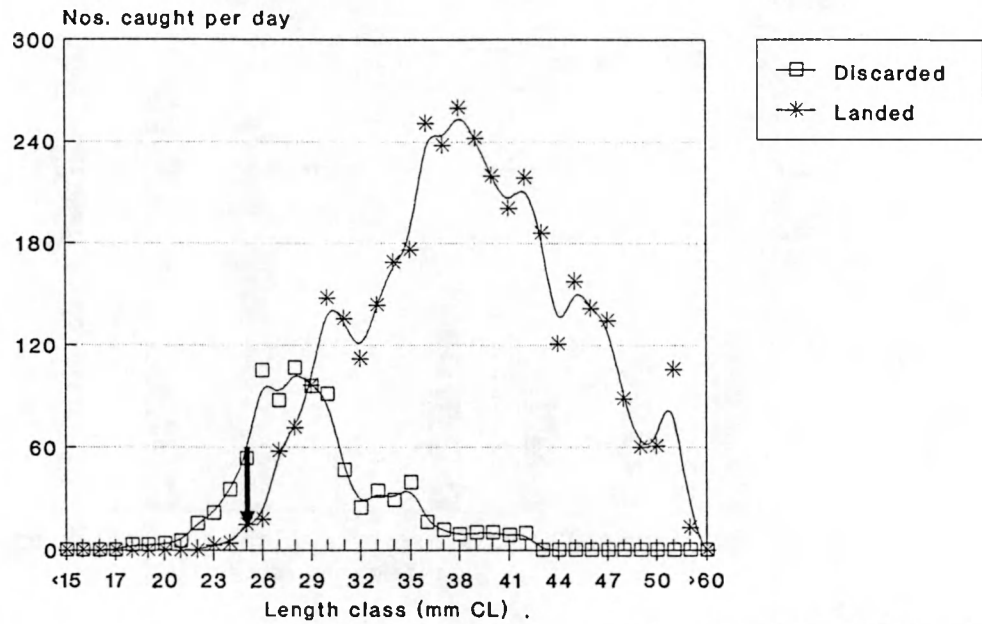


Figure 5.2.1.2. Arrow indicates minimum landing size

Nephrops discards study
 Numbers caught per day
 Campaign 2 : Data set 1 : Females

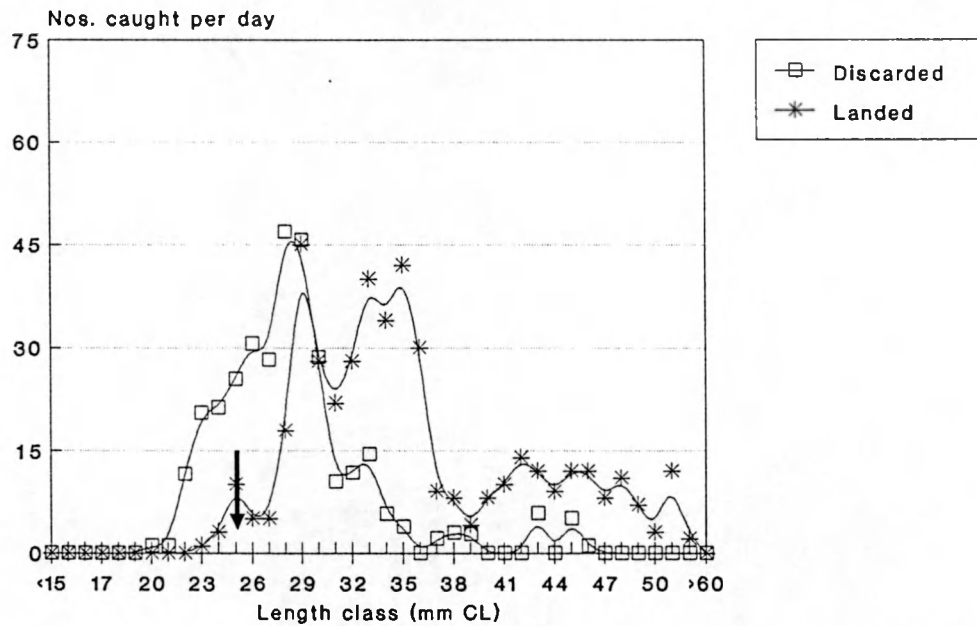


Figure 5.2.1.3. Arrow indicates minimum landing size

Nephrops discards study
 Numbers caught per day
 Campaign 2 : Data set 2 : Males

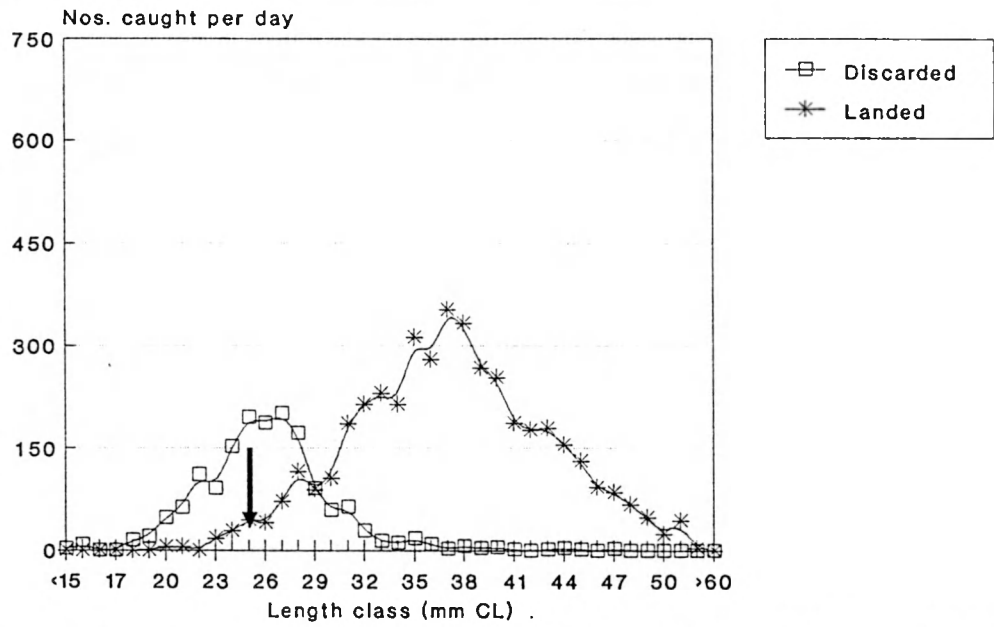


Figure 5.2.1.4.

Arrow indicates minimum landing size

Nephrops discards study
 Numbers caught per day
 Campaign 2 : Data set 2 : Females

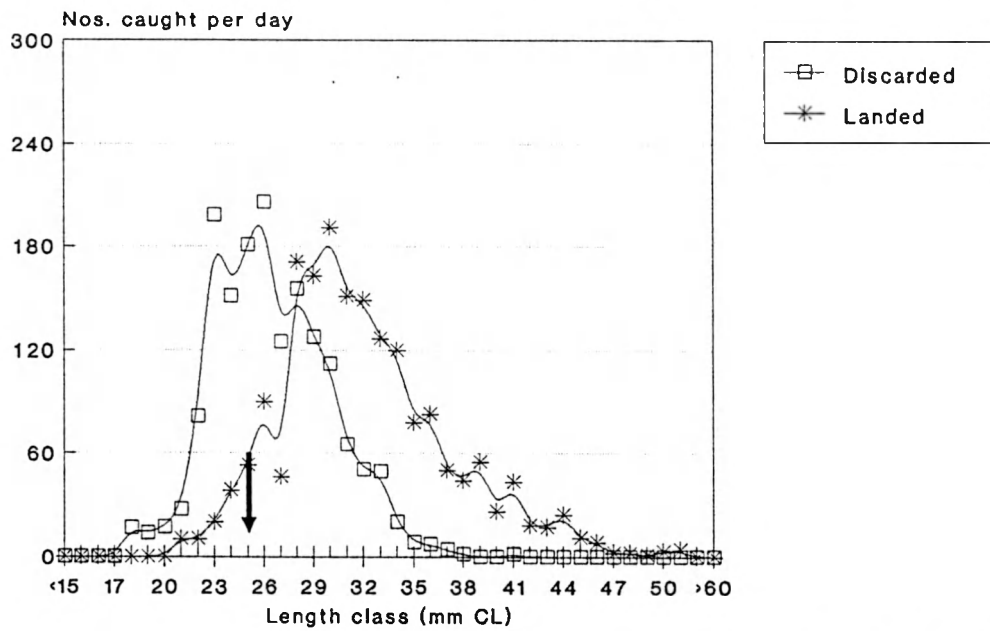


Figure 5.2.1.5.

Arrow indicates minimum landing size

Nephrops discards study
 Numbers caught per day
 Campaign 2 : Data set 3 : Males

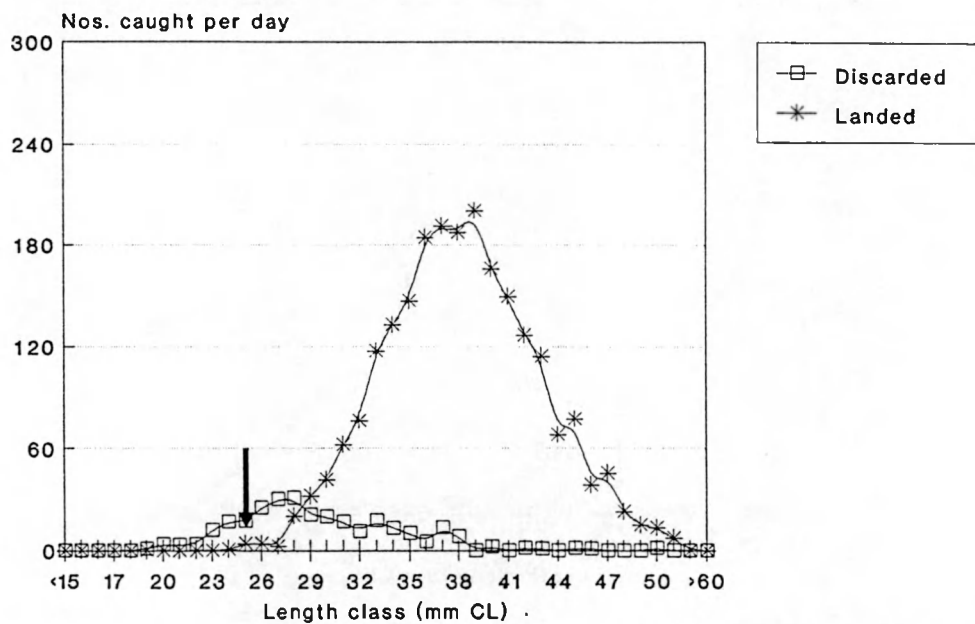


Figure 5.2.1.6. Arrow indicates minimum landing size

Nephrops discards study
 Numbers caught per day
 Campaign 2 : Data set 3 : Females

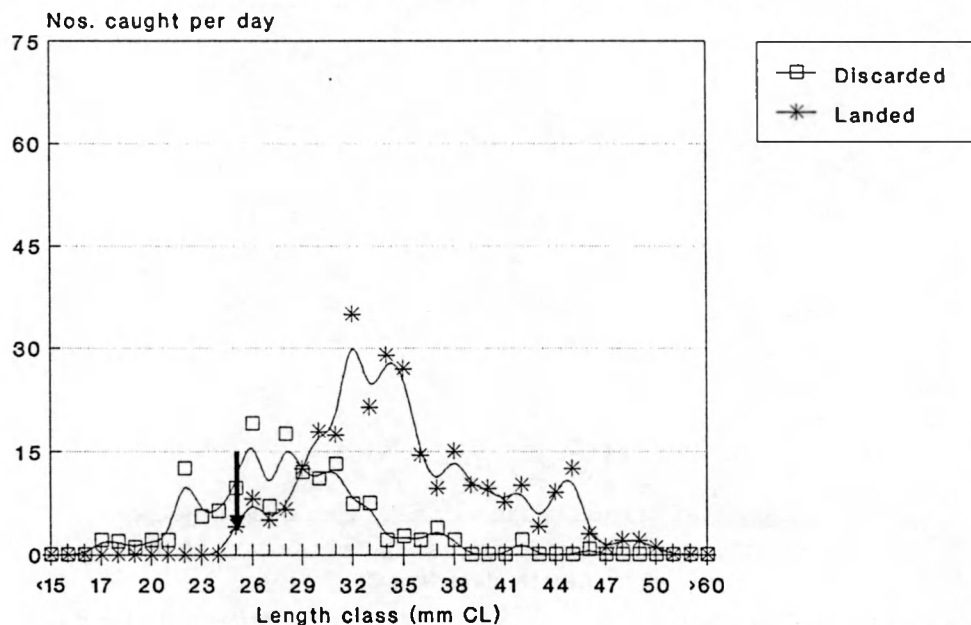


Figure 5.2.1.7. Arrow indicates minimum landing size

Nephrops discards study
 Numbers caught per day
 Campaign 2 : Data sets 1+2+3 : Males

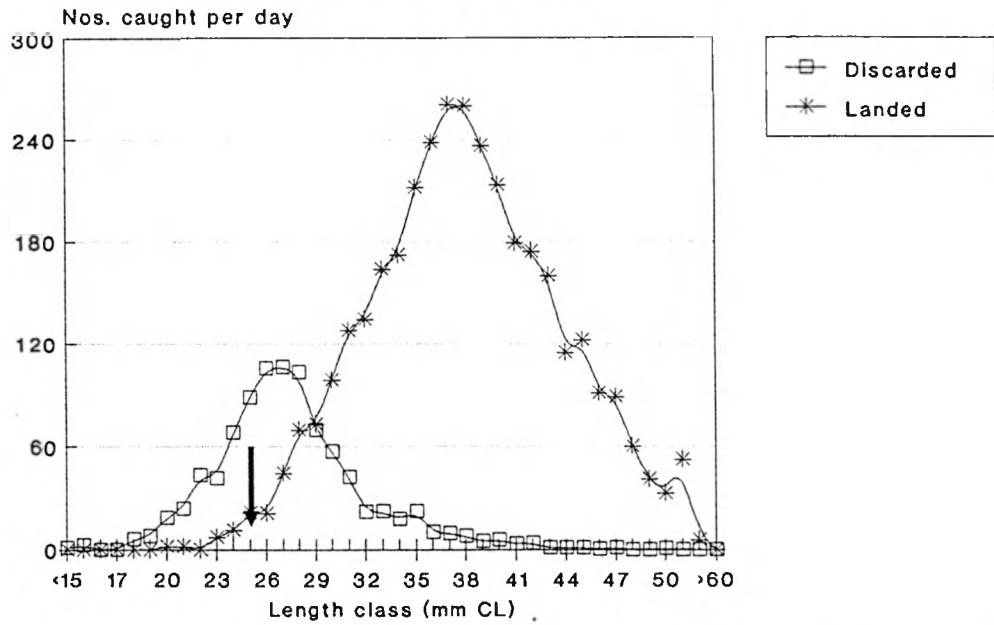


Figure 5.2.1.8.

Arrow indicates minimum landing size

Nephrops discards study
 Numbers caught per day
 Campaign 2 : Data sets 1+2+3 : Females

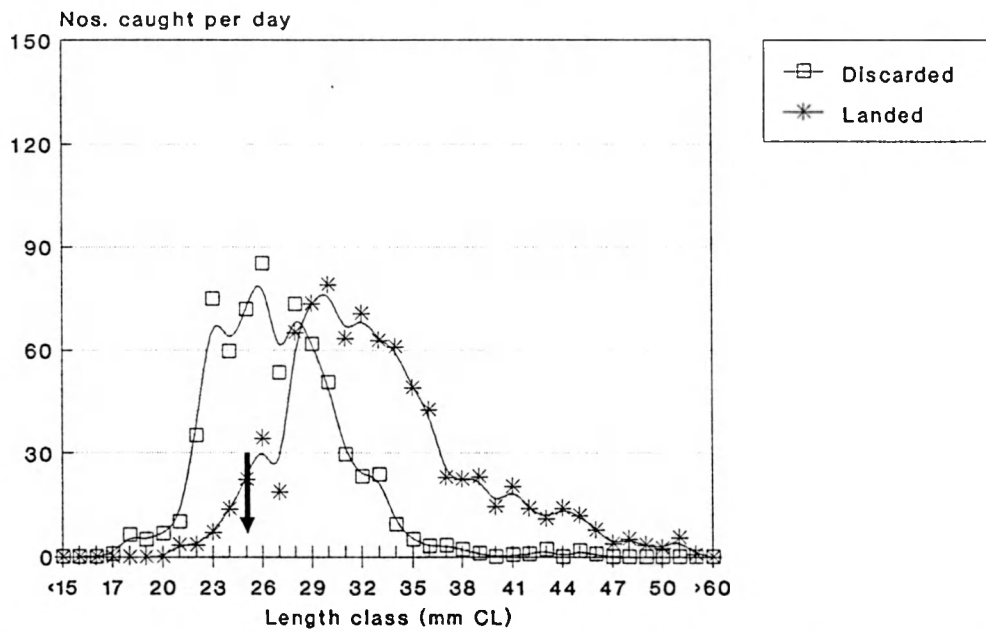


Figure 5.2.1.9.

Arrow indicates minimum landing size

Nephrops discards study
 Numbers caught per day
 Campaign 3 : Data set 1 : Males

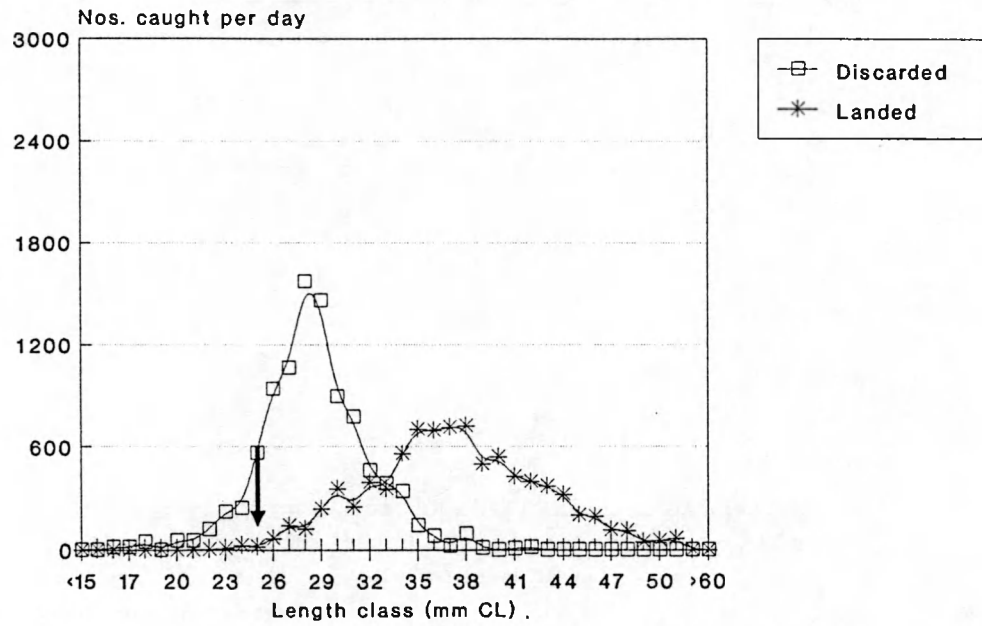


Figure 5.2.1.10. Arrow indicates minimum landing size

Nephrops discards study
 Numbers caught per day
 Campaign 3 : Data set 1 : Females

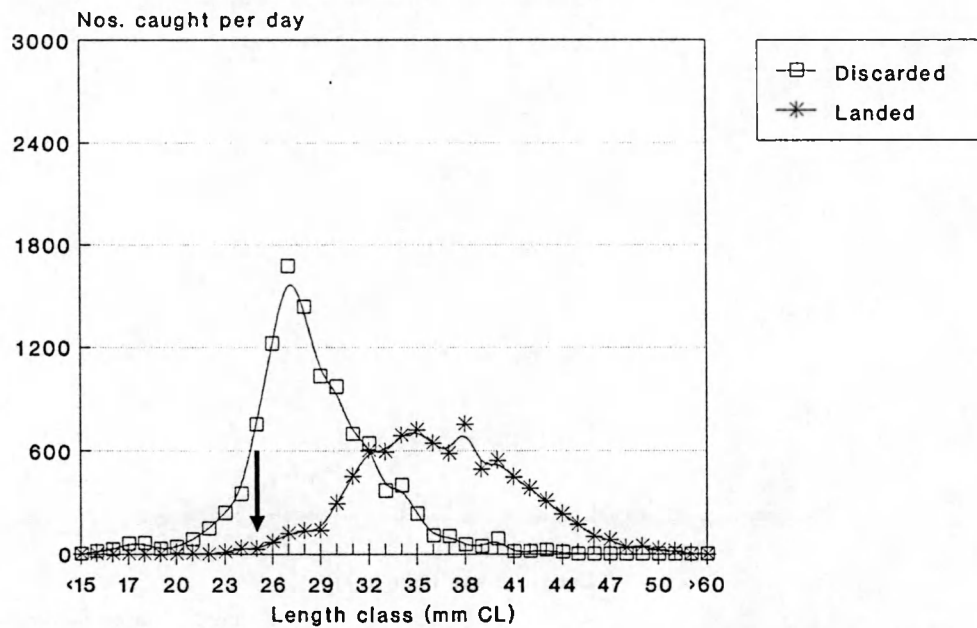
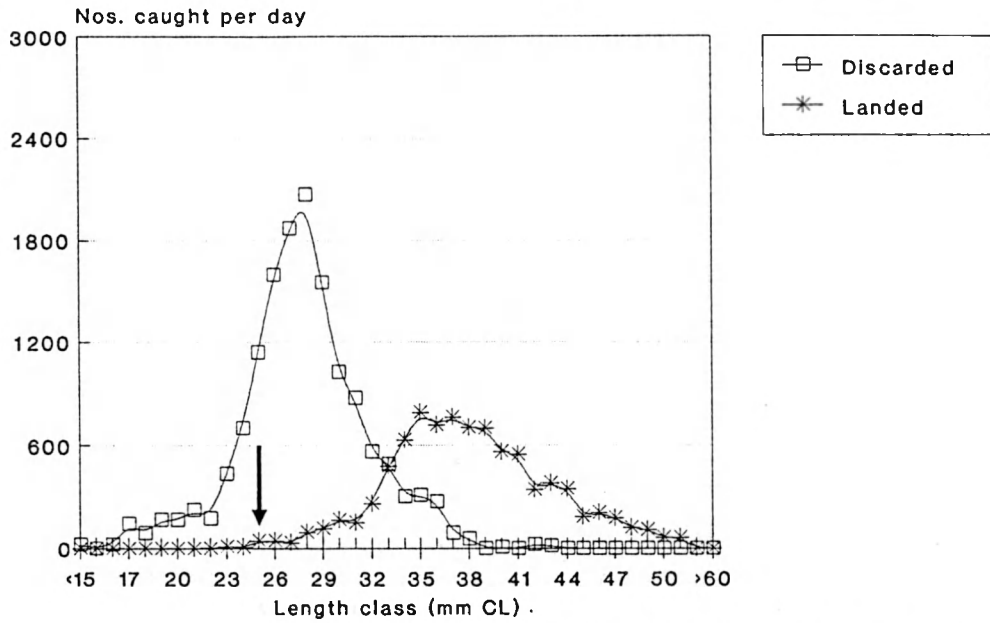


Figure 5.2.1.11. Arrow indicates minimum landing size

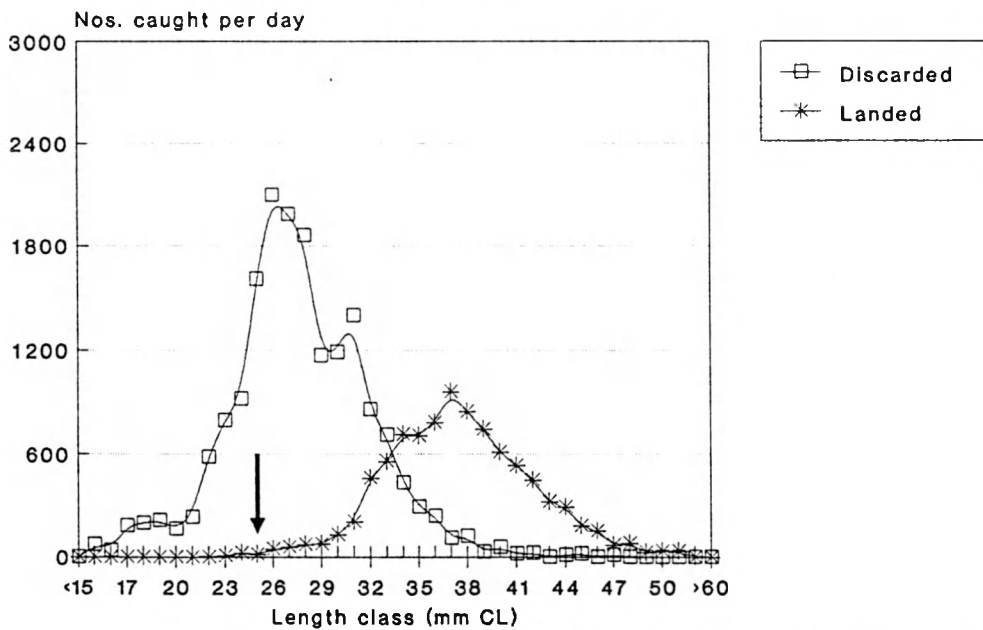
Nephrops discards study
 Numbers caught per day
 Campaign 3 : Data set 2 : Males



Arrow indicates minimum landing size

Figure 5.2.1.12.

Nephrops discards study
 Numbers caught per day
 Campaign 3 : Data set 2 : Females



Arrow indicates minimum landing size

Figure 5.2.1.13.

Nephrops discards study
 Numbers caught per day
 Campaign 3 : Data set 3 : Males

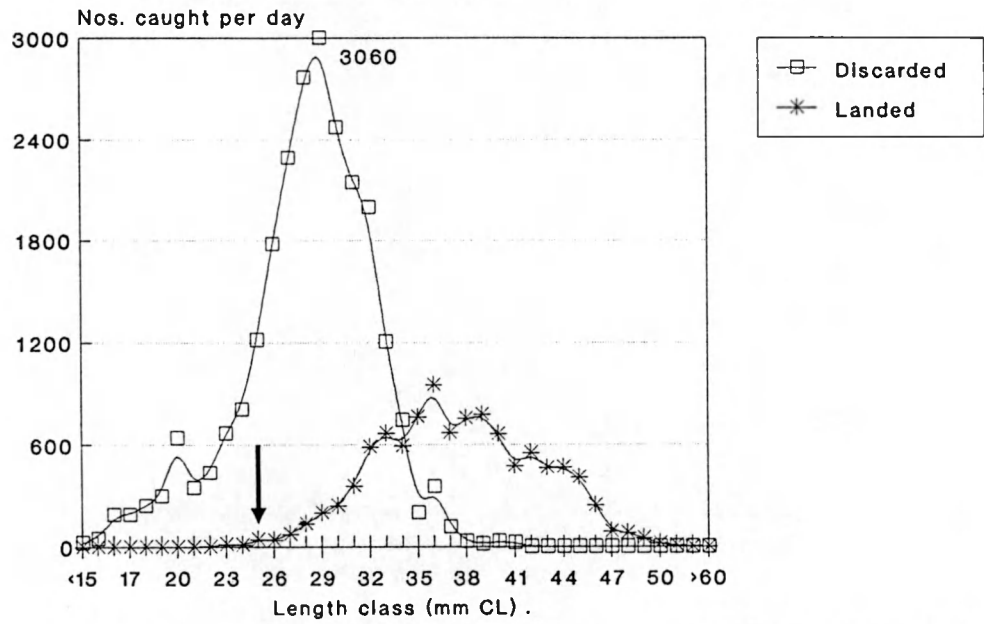


Figure 5.2.1.14.

Arrow indicates minimum landing size

Nephrops discards study
 Numbers caught per day
 Campaign 3 : Data set 3 : Females

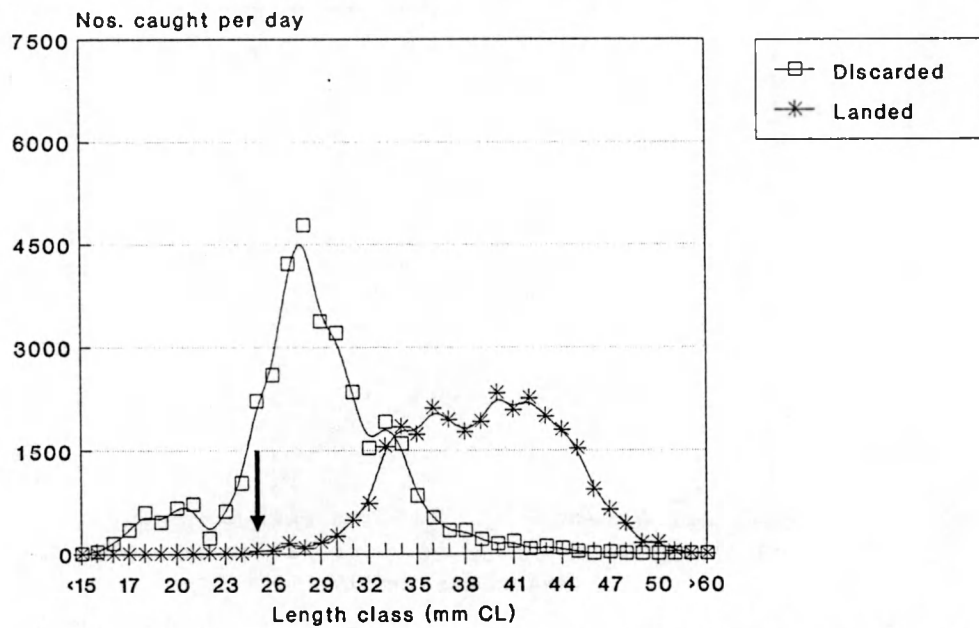
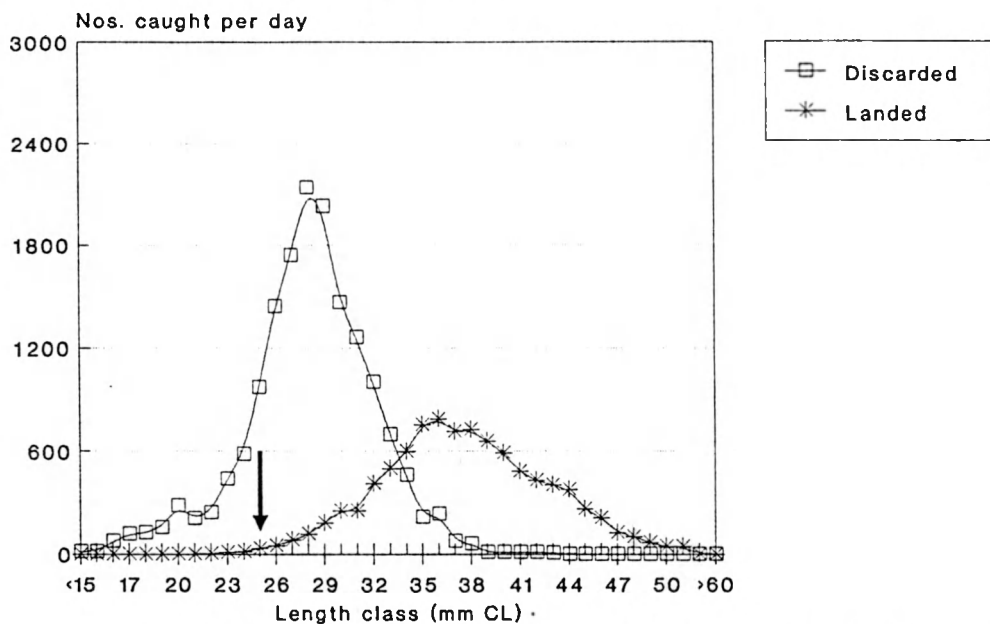


Figure 5.2.1.15.

Arrow indicates minimum landing size

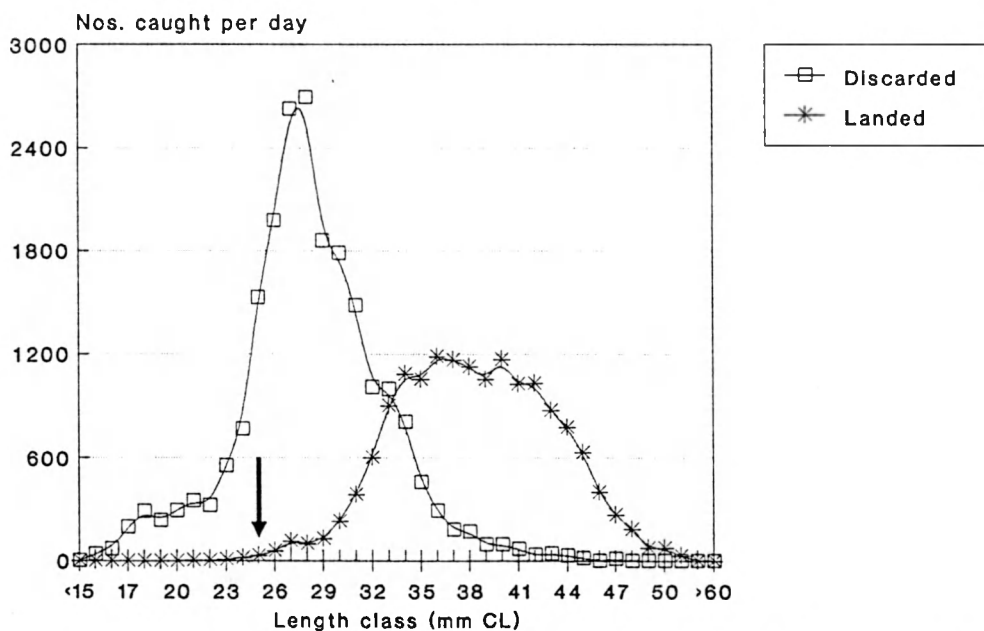
Nephrops discards study
 Numbers caught per day
 Campaign 3 : Data set 1+2+3 : Males



Arrow indicates minimum landing size

Figure 5.2.1.16.

Nephrops discards study
 Numbers caught per day
 Campaign 3 : Data set 1+2+3 : Females



Arrow indicates minimum landing size

Figure 5.2.1.17.

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 2 : Data set 1 : Males

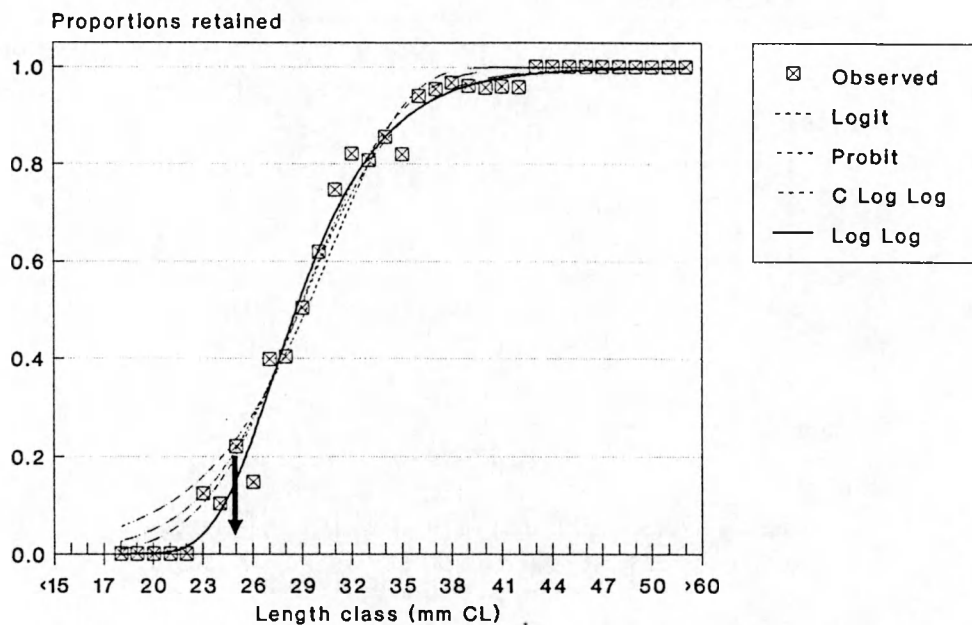


Figure 5.2.1.18.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 2 : Data set 1 : Females

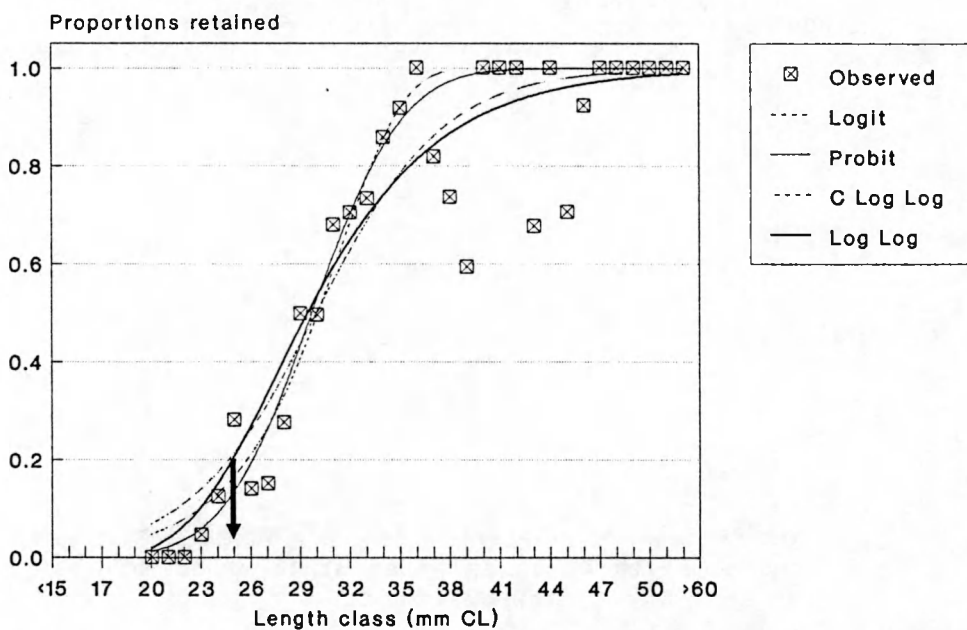


Figure 5.2.1.19.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 2 : Data set 2 : Males

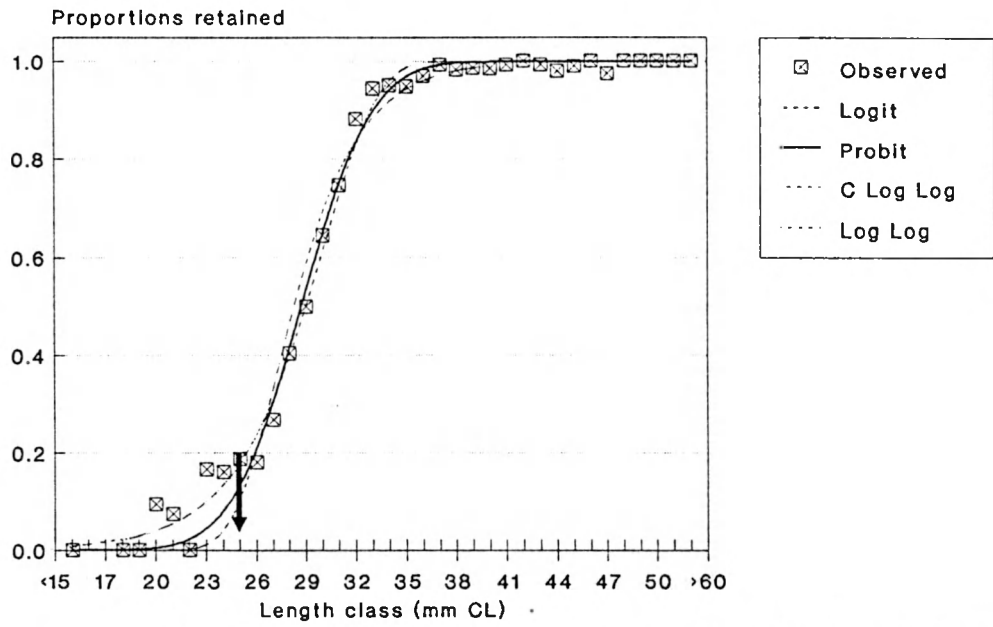


Figure 5.2.1.20.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 2 : Data set 2 : Females

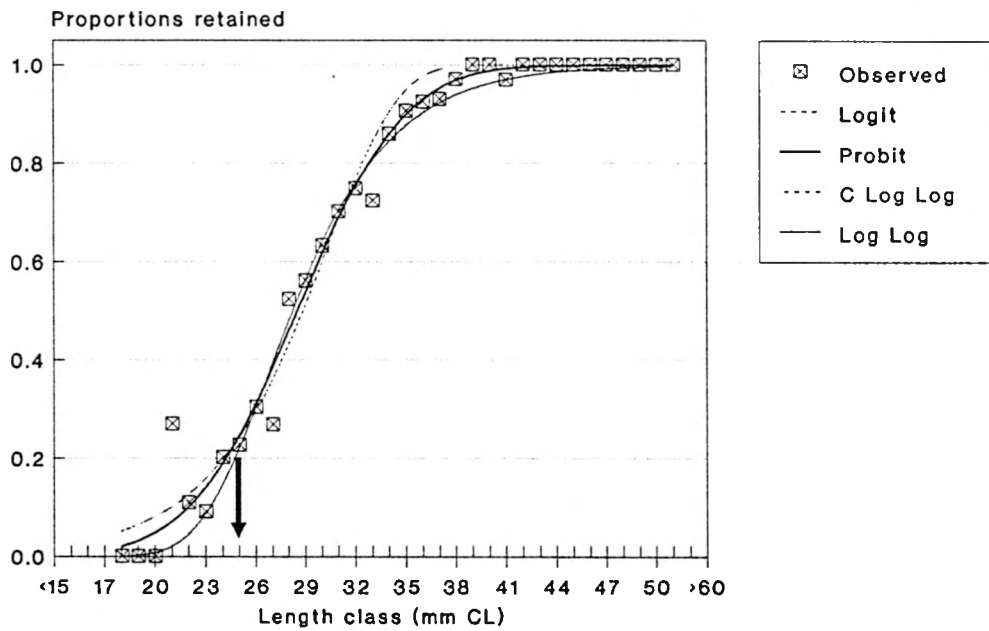


Figure 5.2.1.21.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 2 : Data set 3 : Males

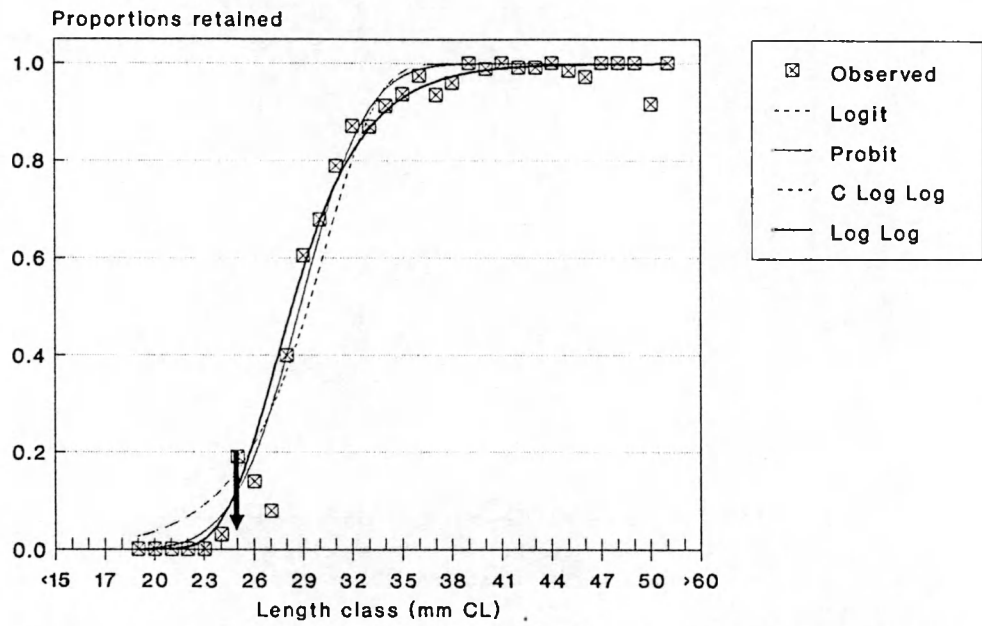


Figure 5.2.1.22.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 2 : Data set 3 : Females

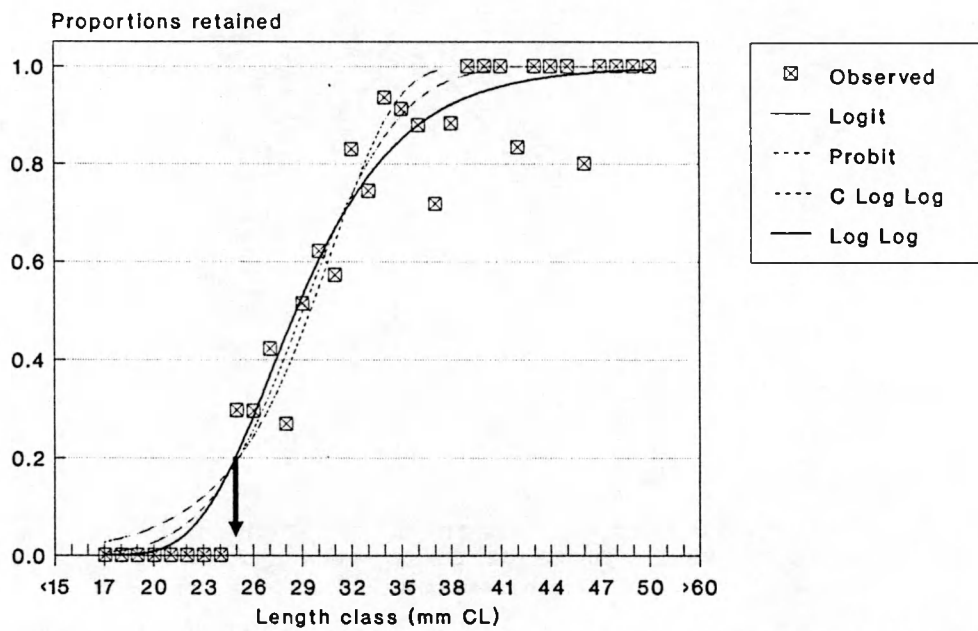


Figure 5.2.1.23.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 2 : Data sets 1+2+3 : Males

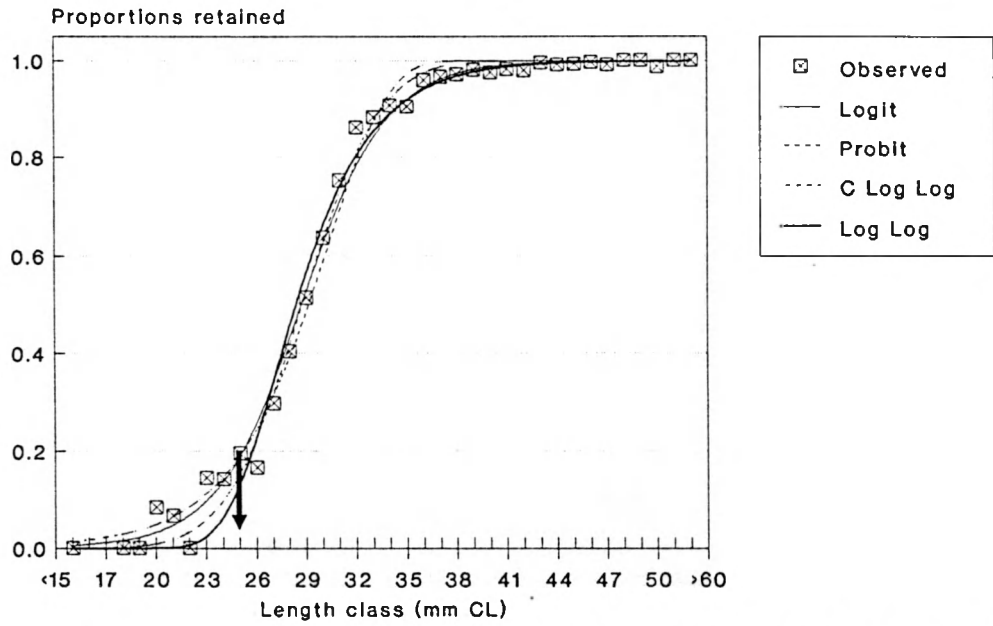


Figure 5.2.1.24.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 2 : Data sets 1+2+3 : Females

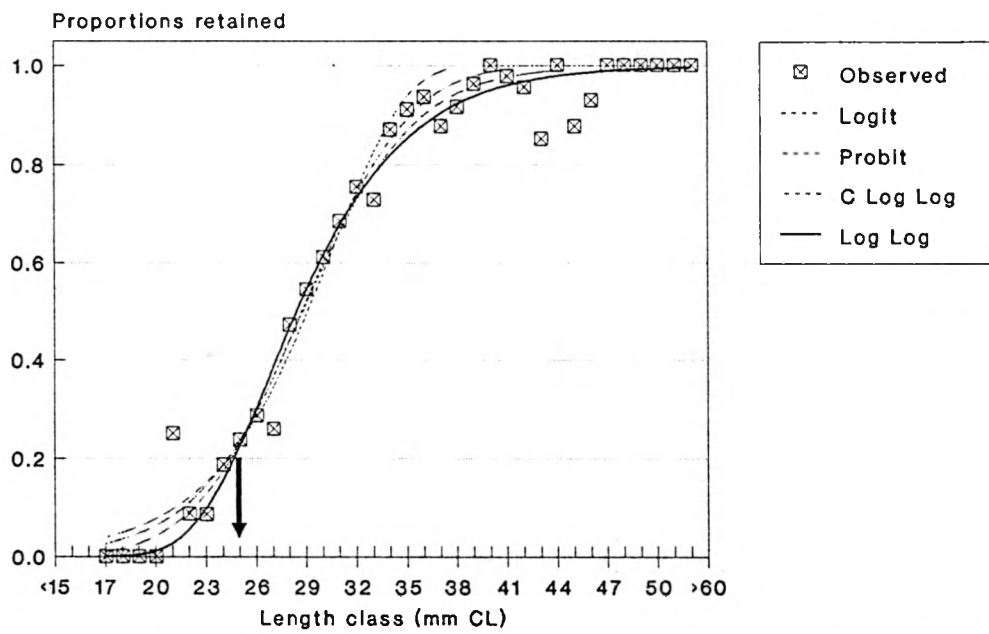


Figure 5.2.1.25.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 3 : Data set 1 : Males

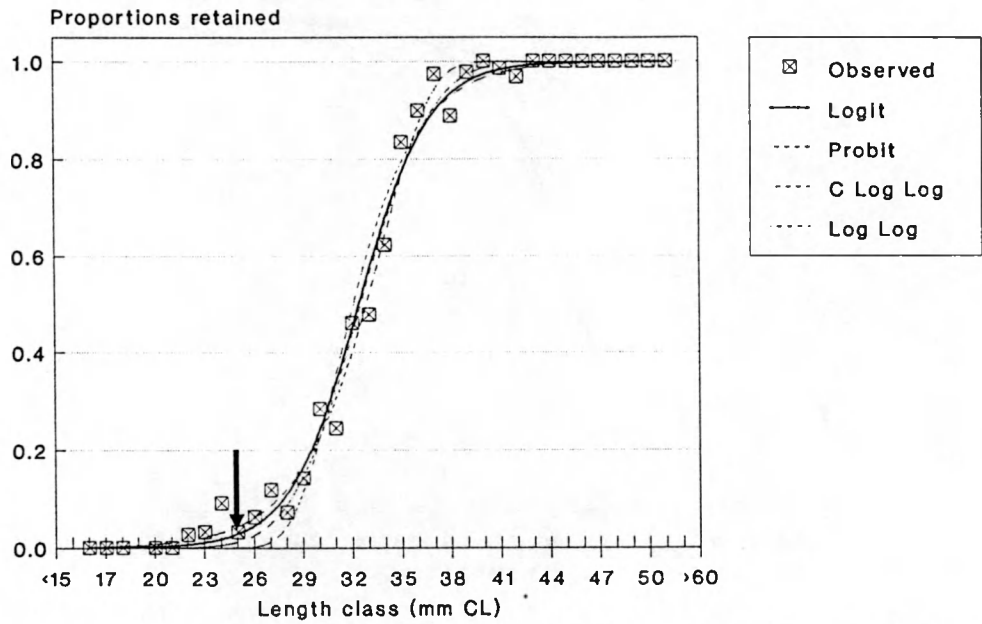


Figure 5.2.1.26.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 3 : Data set 1 : Females

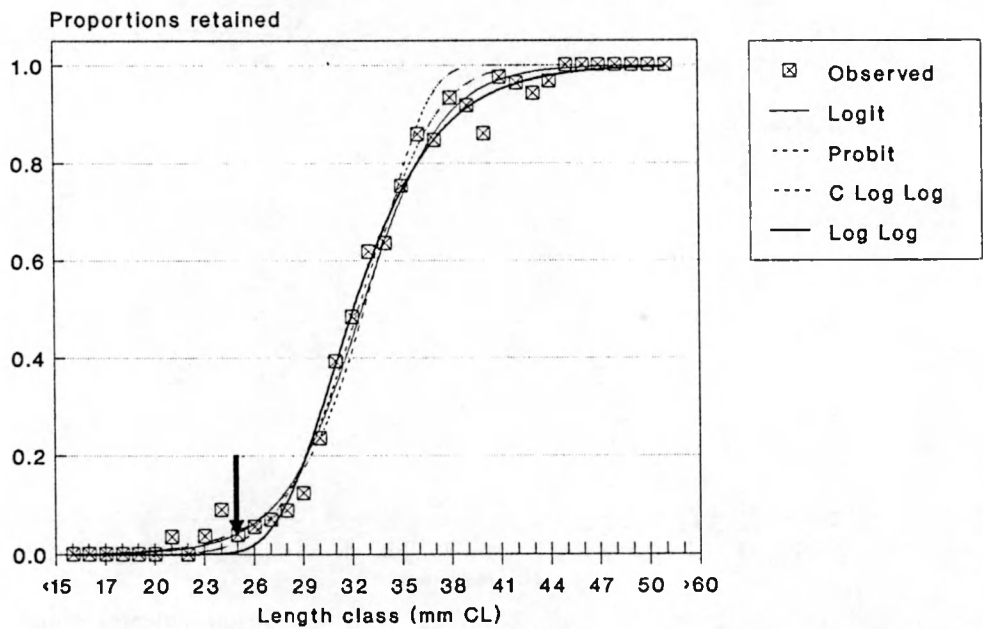


Figure 5.2.1.27.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 3 : Data set 2 : Males

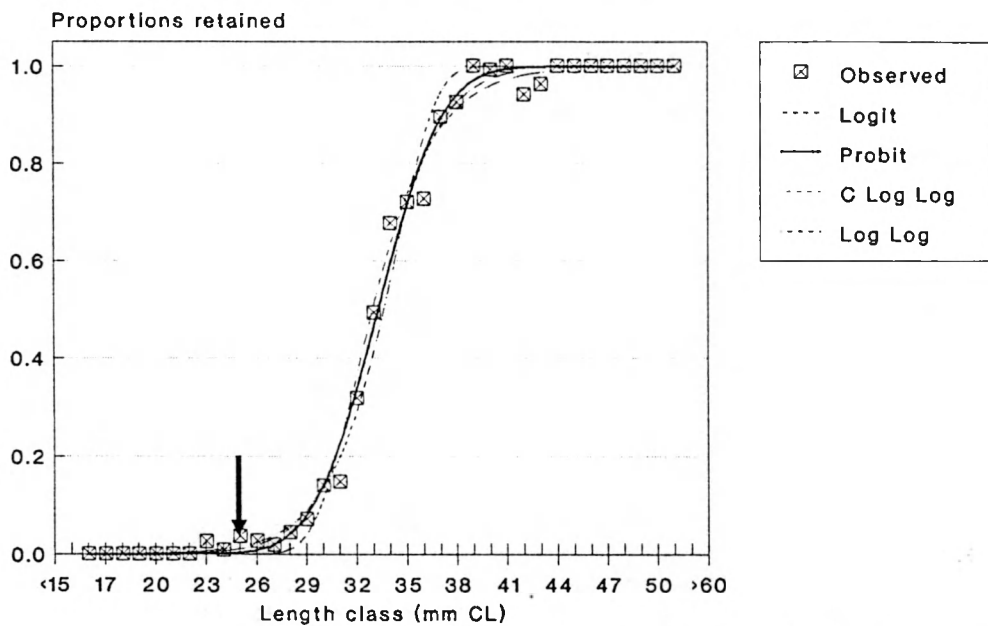


Figure 5.2.1.28.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 3 : Data set 2 : Females

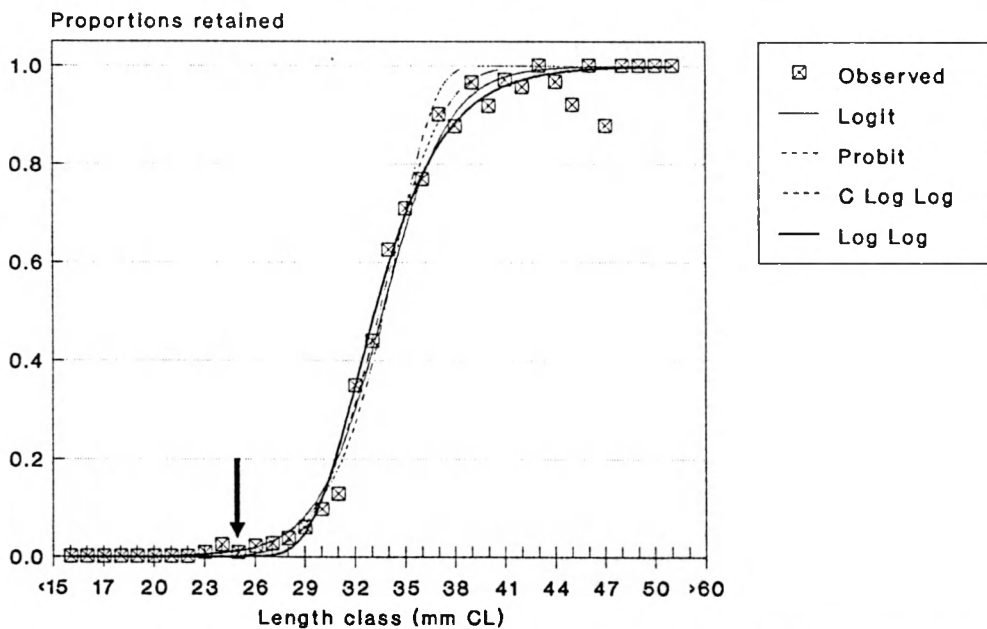


Figure 5.2.1.29.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 3 : Data set 3 : Males

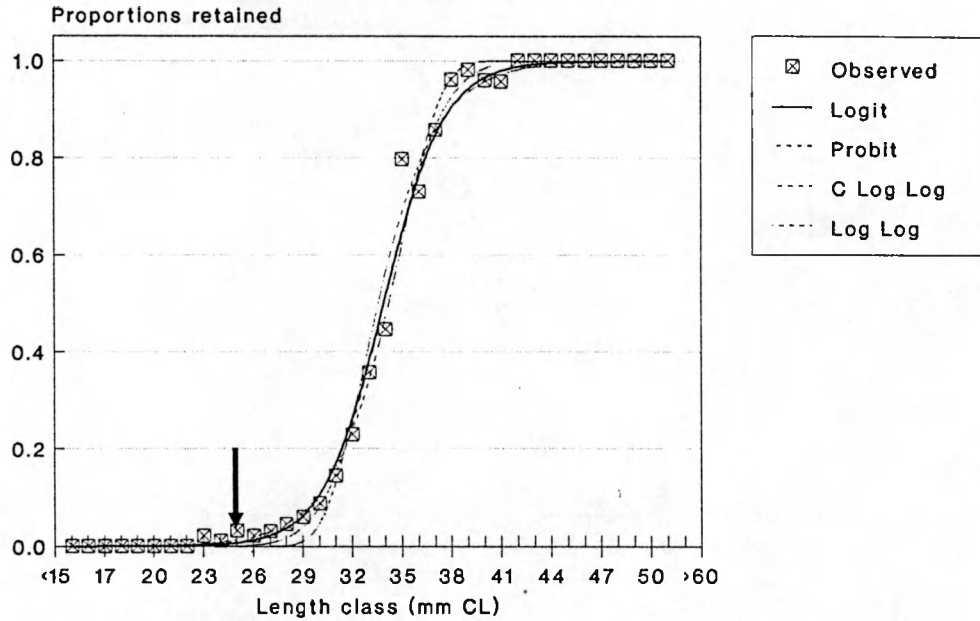


Figure 5.2.1.30.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 3 : Data set 3 : Females

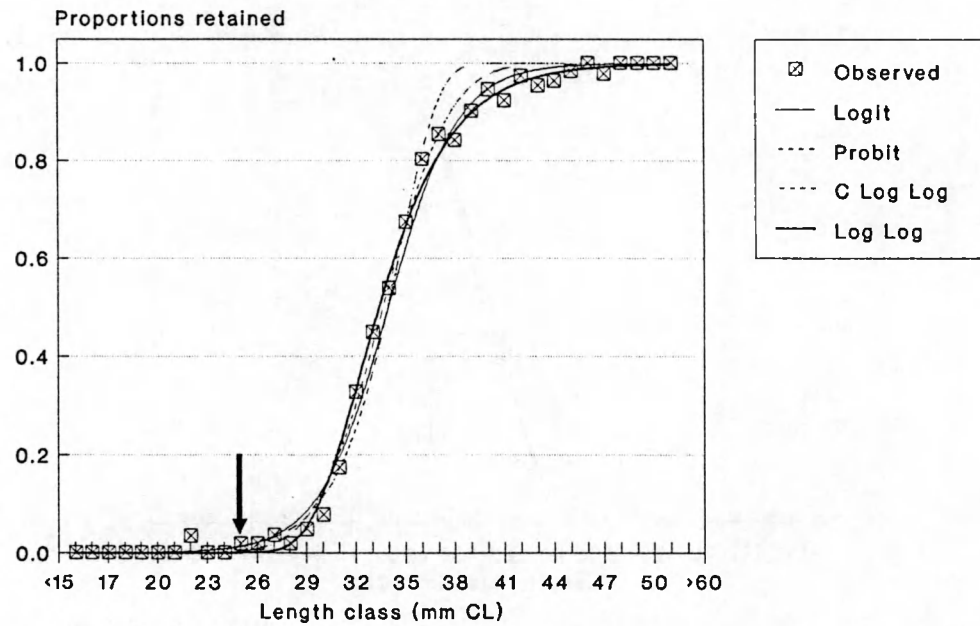


Figure 5.2.1.31.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 3 : Data sets 1+2+3 : Males

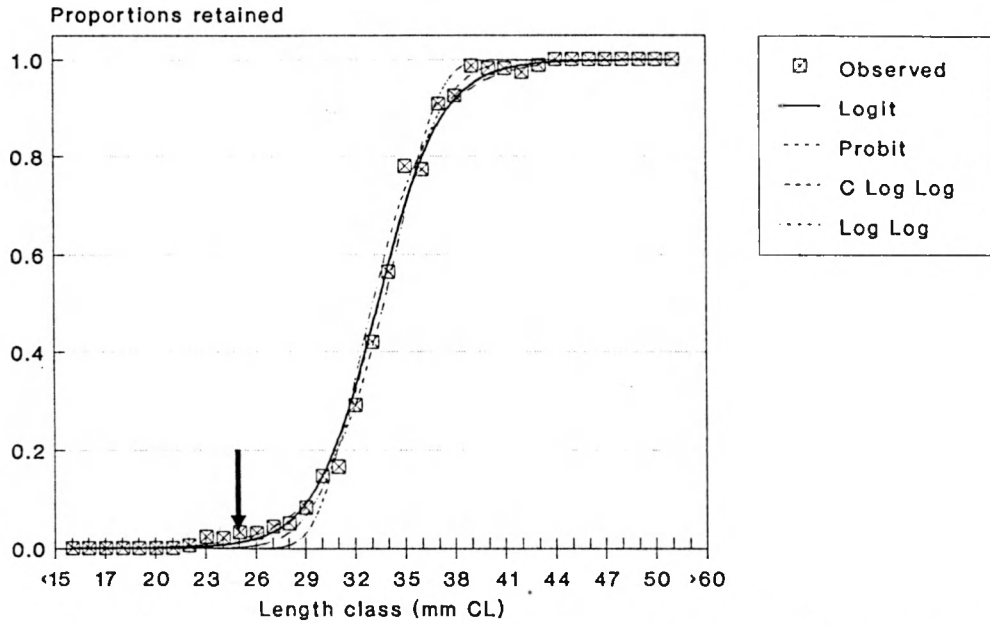


Figure 5.2.1.32.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Campaign 3 : Data sets 1+2+3 : Females

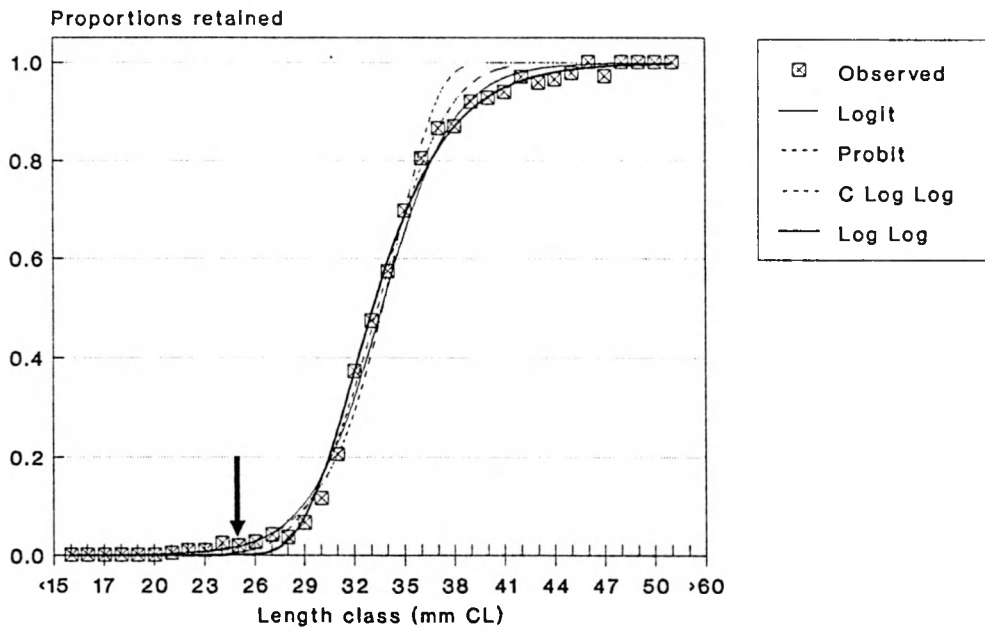


Figure 5.2.1.33.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Comparative study : Males

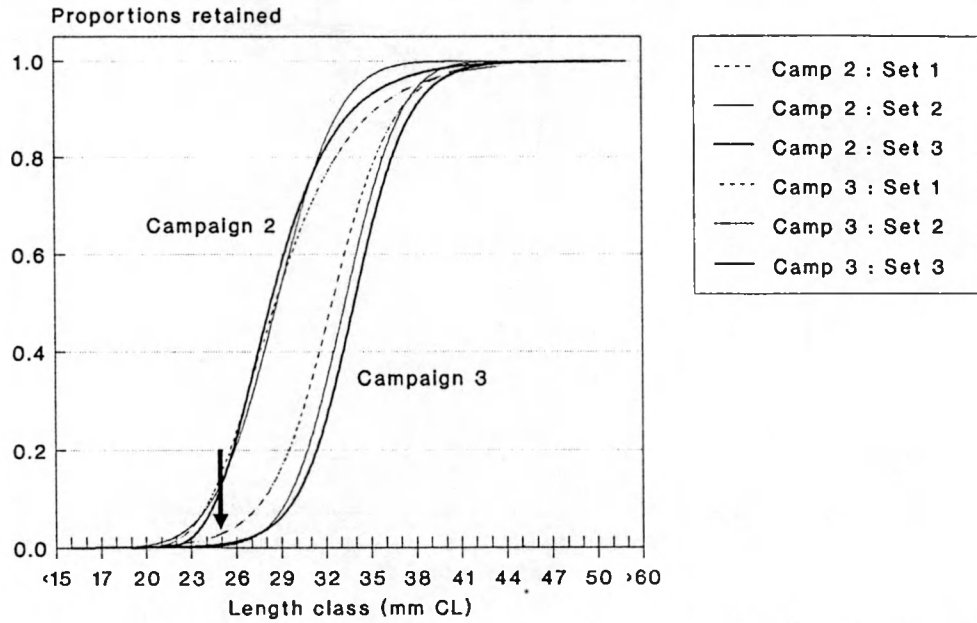


Figure 5.2.134.

Arrow indicates minimum landing size

Fishermen's selection : Nephrops
 Selection curve fitting
 Comparative study : Females

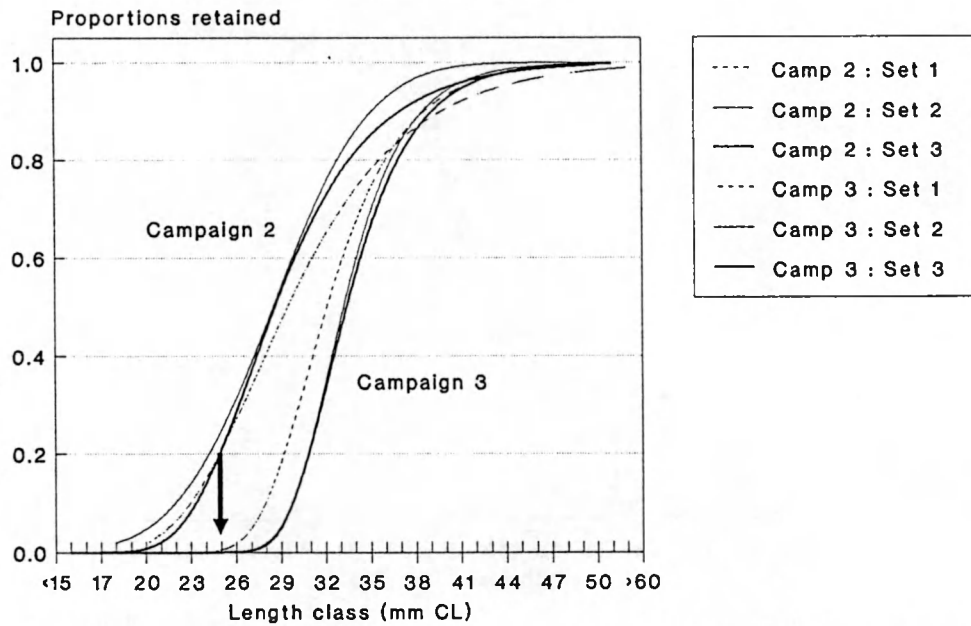
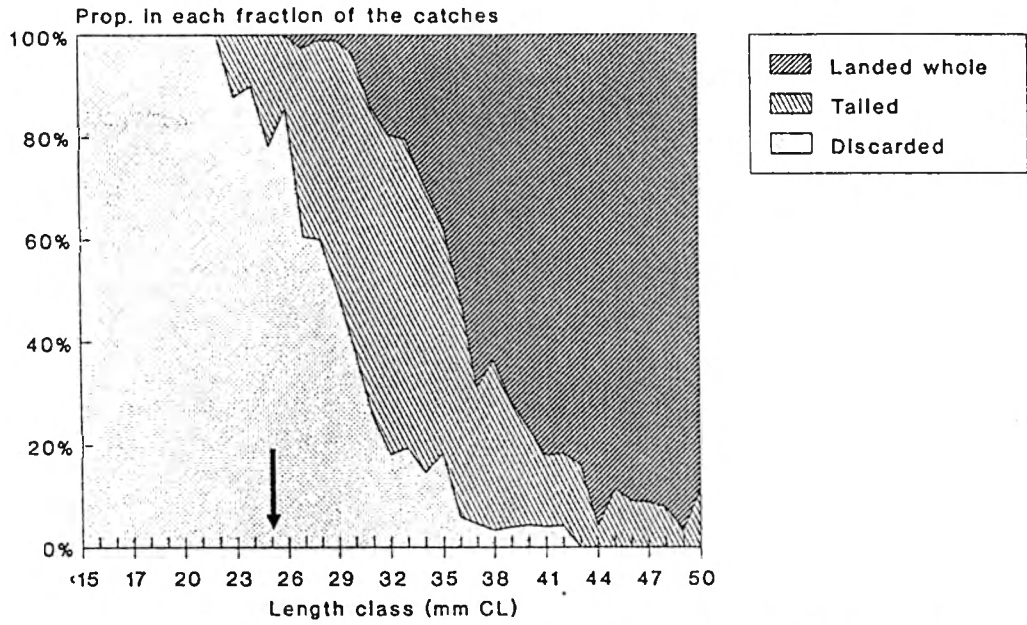


Figure 5.2.135.

Arrow indicates minimum landing size

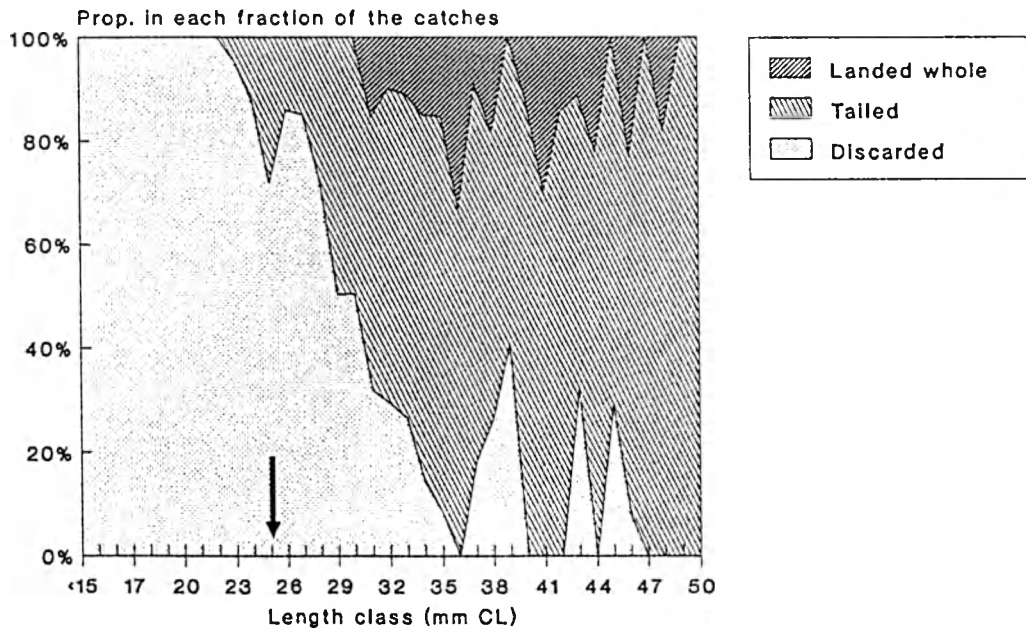
Nephrops discards study
 Proportional composition of catches
 Campaign 2 : Data set 1 : Males



Arrow indicates minimum landing size

Figure 5.2.1.36.

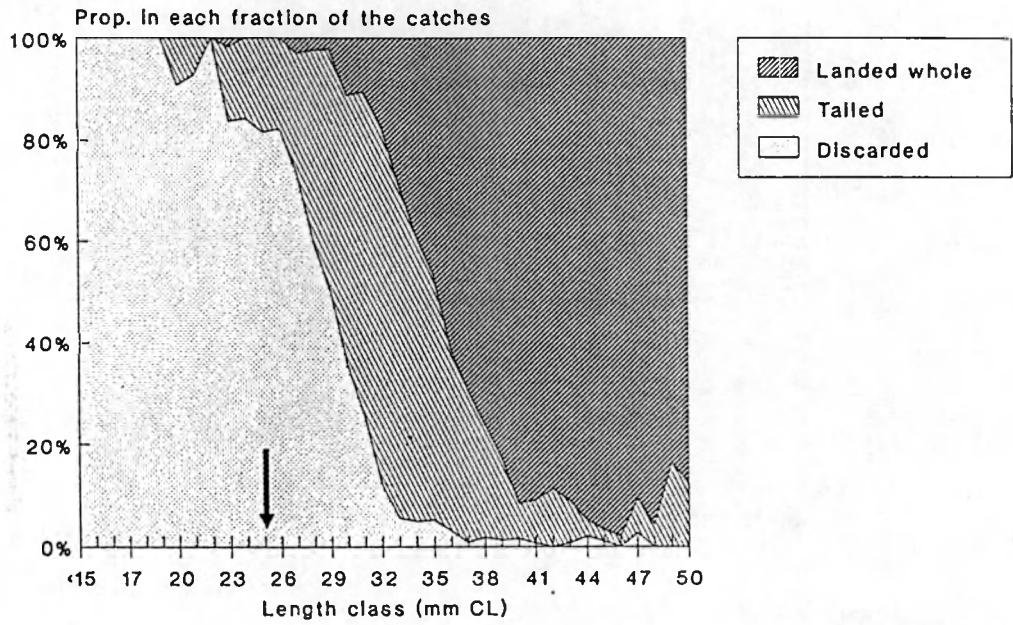
Nephrops discards study
 Proportional composition of catches
 Campaign 2 : Data set 1 : Females



Arrow indicates minimum landing size

Figure 5.2.1.37.

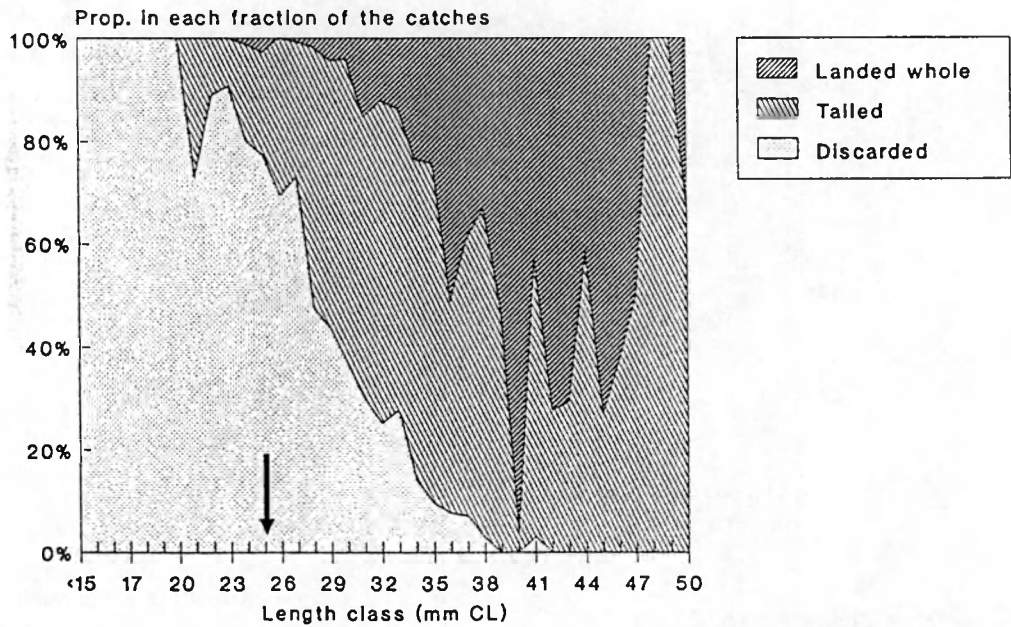
Nephrops discards study
 Proportional composition of catches
 Campaign 2 : Data set 2 : Males



Arrow indicates minimum landing size

Figure 5.2.1.38.

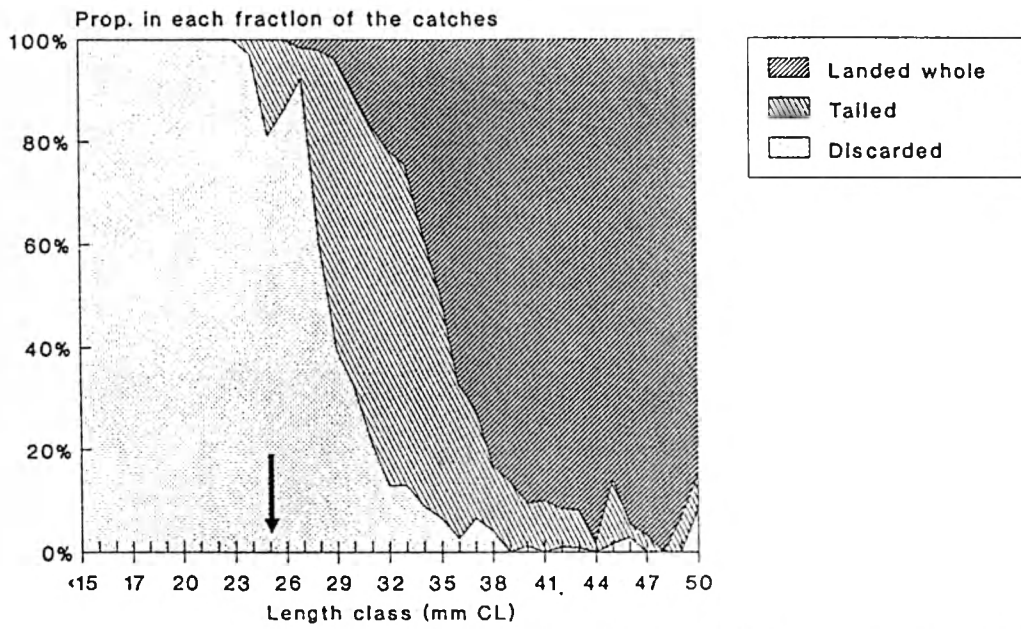
Nephrops discards study
 Proportional composition of catches
 Campaign 2 : Data set 2 : Females



Arrow indicates minimum landing size

Figure 5.2.1.39.

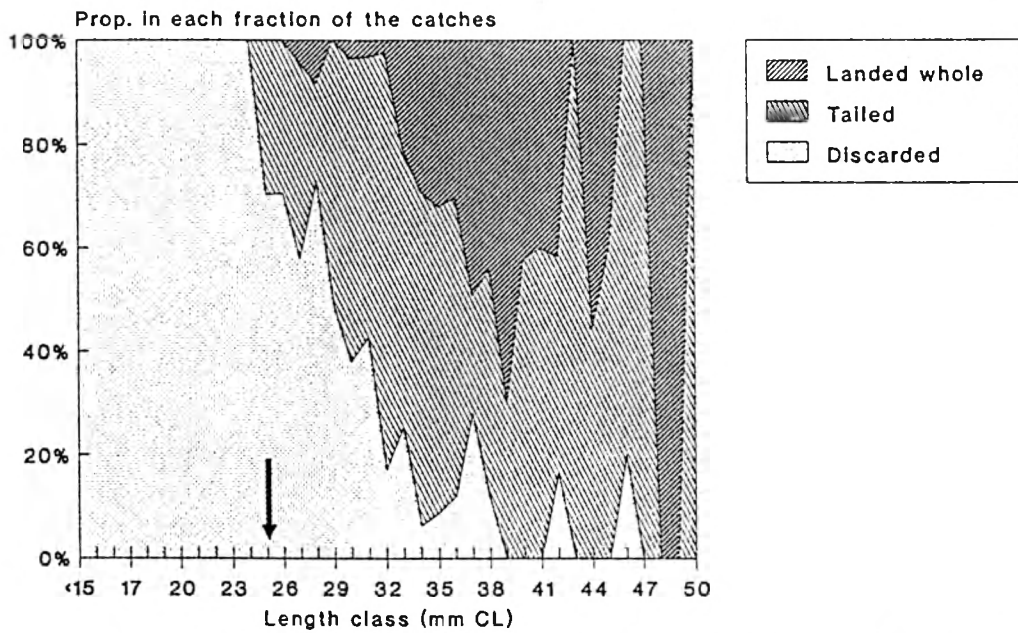
Nephrops discards study
 Proportional composition of catches
 Campaign 2 : Data set 3 : Males



Arrow indicates minimum landing size

Figure 5.2.1.40.

Nephrops discards study
 Proportional composition of catches
 Campaign 2 : Data set 3 : Females



Arrow indicates minimum landing size

Figure 5.2.1.41.

Nephrops discards study
 Proportional composition of catches
 Campaign 2 : Data sets 1+2+3 : Males

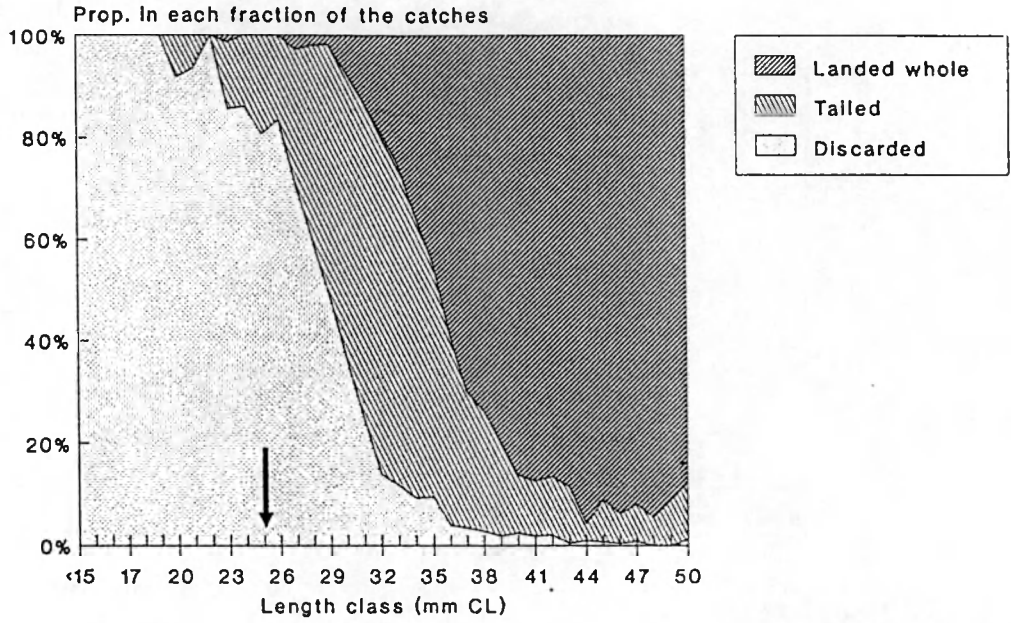


Figure 5.2.1.42.

Nephrops discards study
 Proportional composition of catches
 Campaign 2 : Data sets 1+2+3 : Females

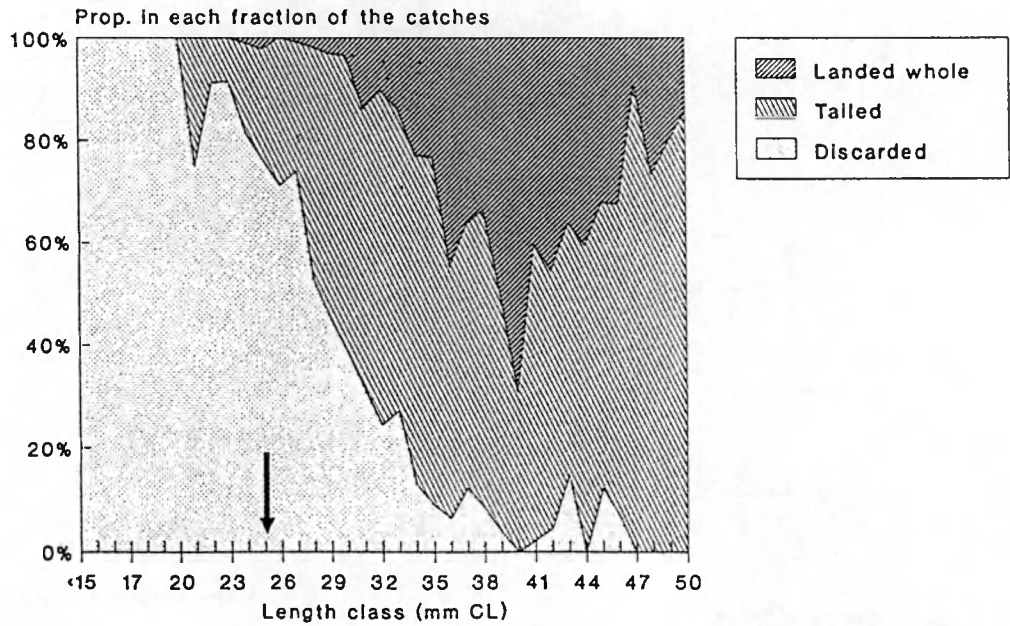
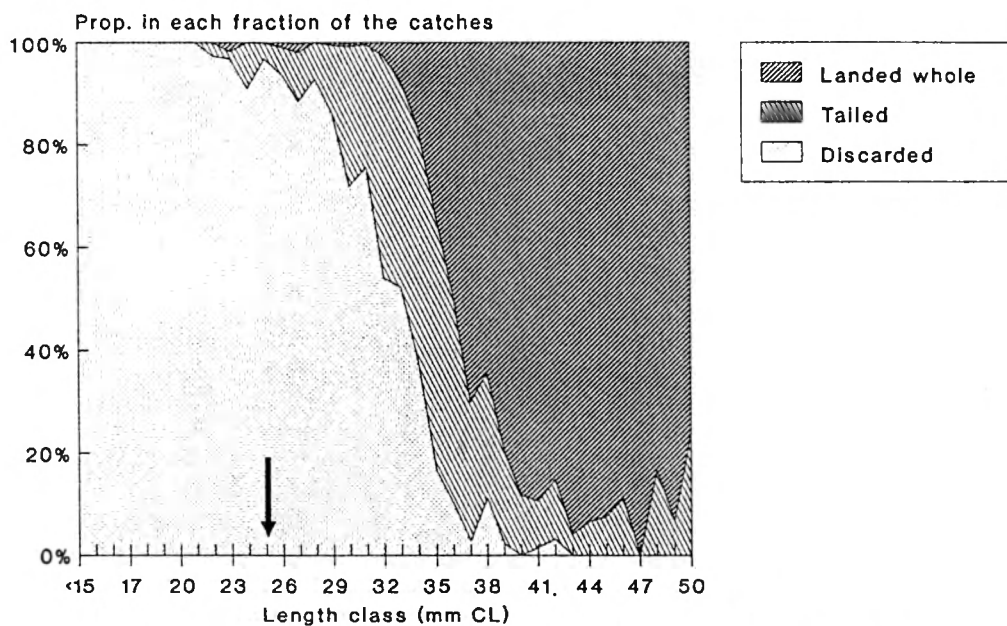


Figure 5.2.1.43.

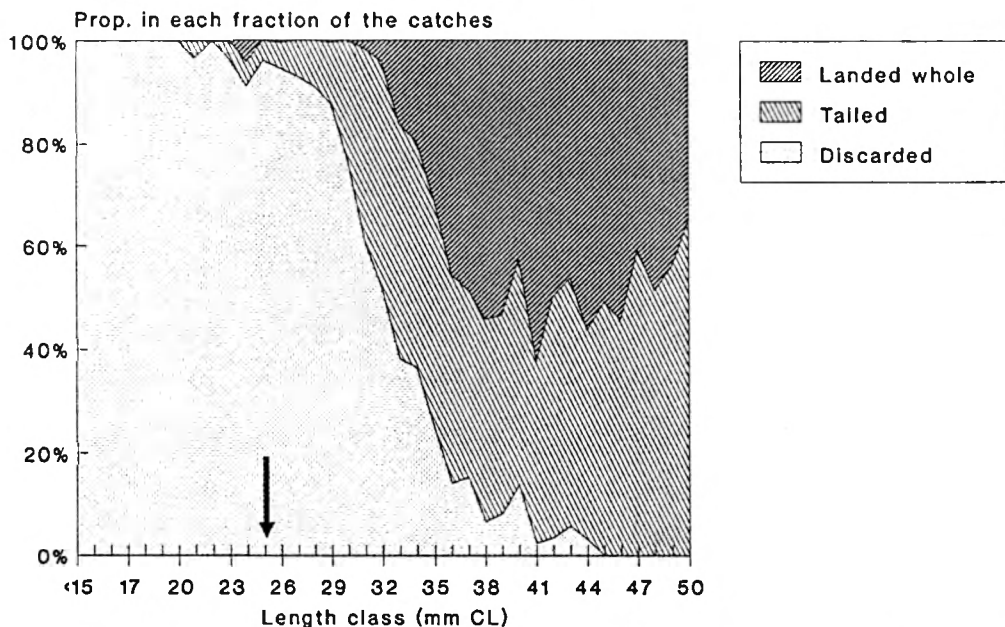
Nephrops discards study
 Proportional composition of catches
 Campaign 3 : Data set 1 : Males



Arrow indicates minimum landing size

Figure 5.2.1.44.

Nephrops discards study
 Proportional composition of catches
 Campaign 3 : Data set 1 : Females



Arrow indicates minimum landing size

Figure 5.2.1.45.

Nephrops discards study
 Proportional composition of catches
 Campaign 3 : Data set 2 : Males

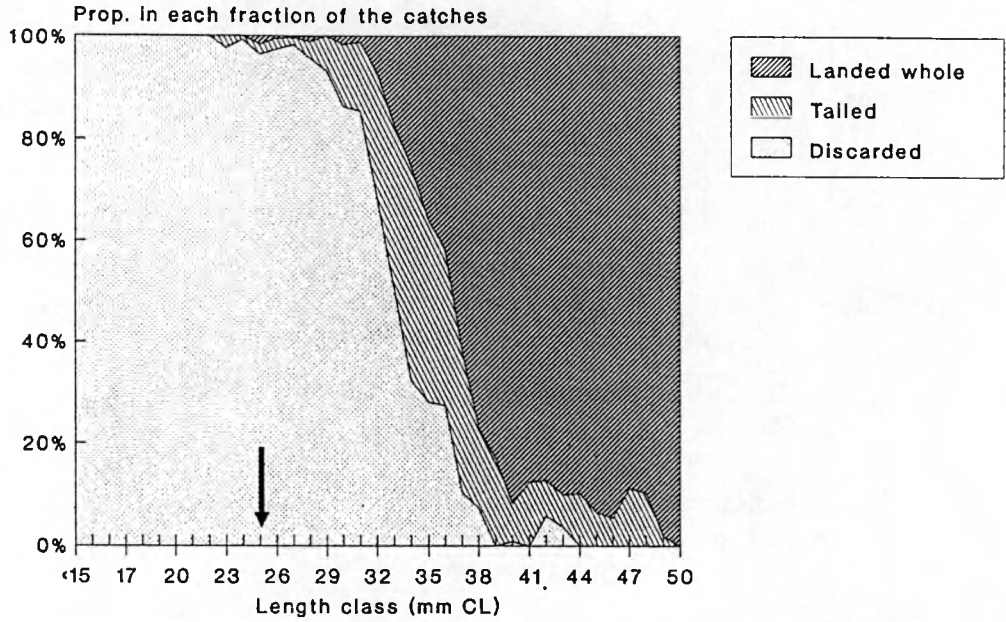


Figure 5.2.1.46.

Arrow indicates minimum landing size

Nephrops discards study
 Proportional composition of catches
 Campaign 3 : Data set 2 : Females

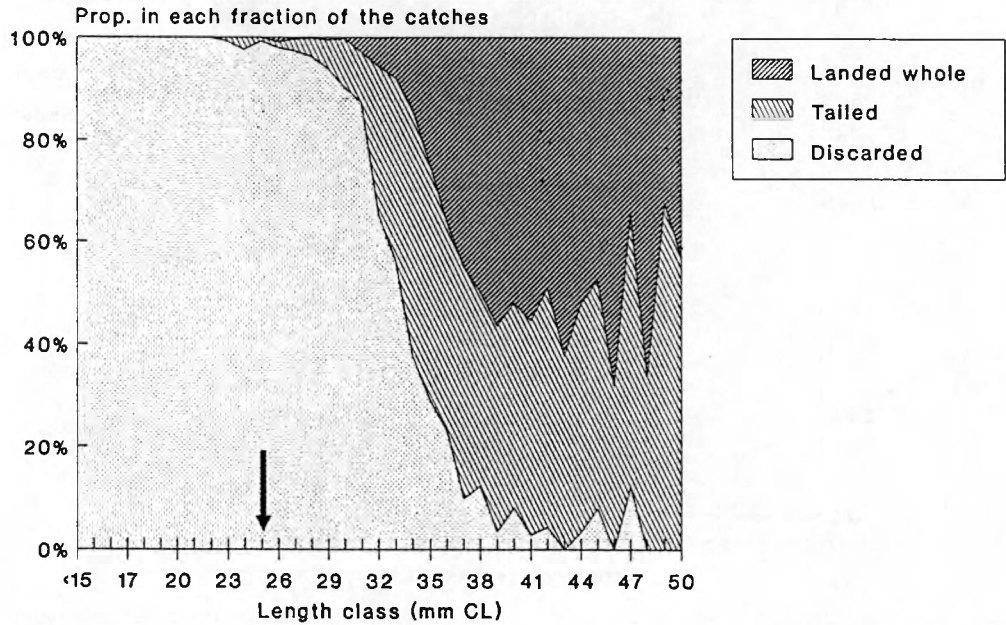


Figure 5.2.1.47.

Arrow indicates minimum landing size

Nephrops discards study
 Proportional composition of catches
 Campaign 3 : Data set 3 : Males

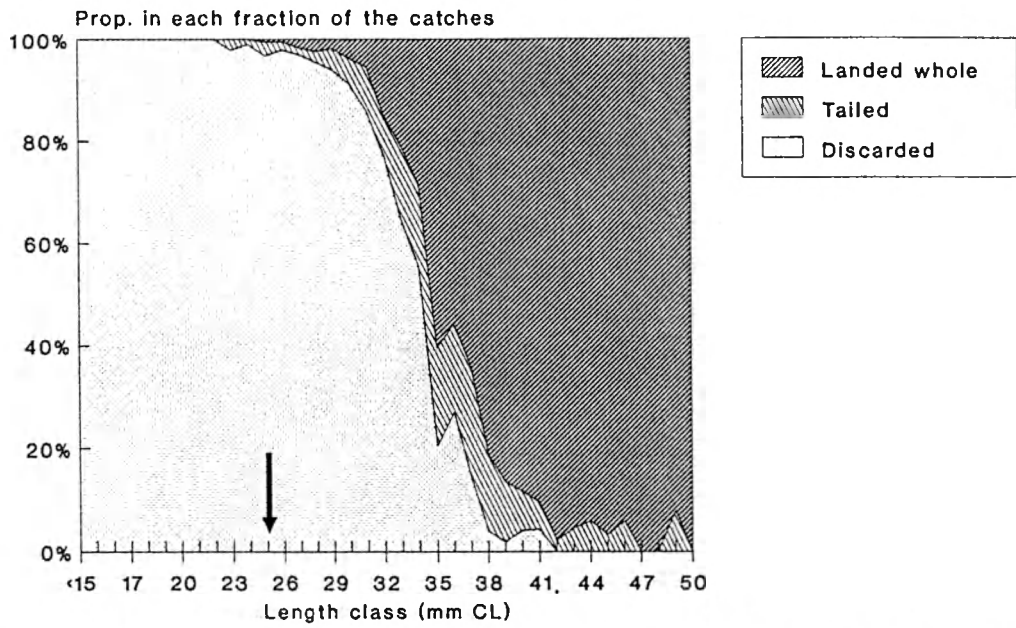


Figure 5.2.148.

Nephrops discards study
 Proportional composition of catches
 Campaign 3 : Data set 3 : Females

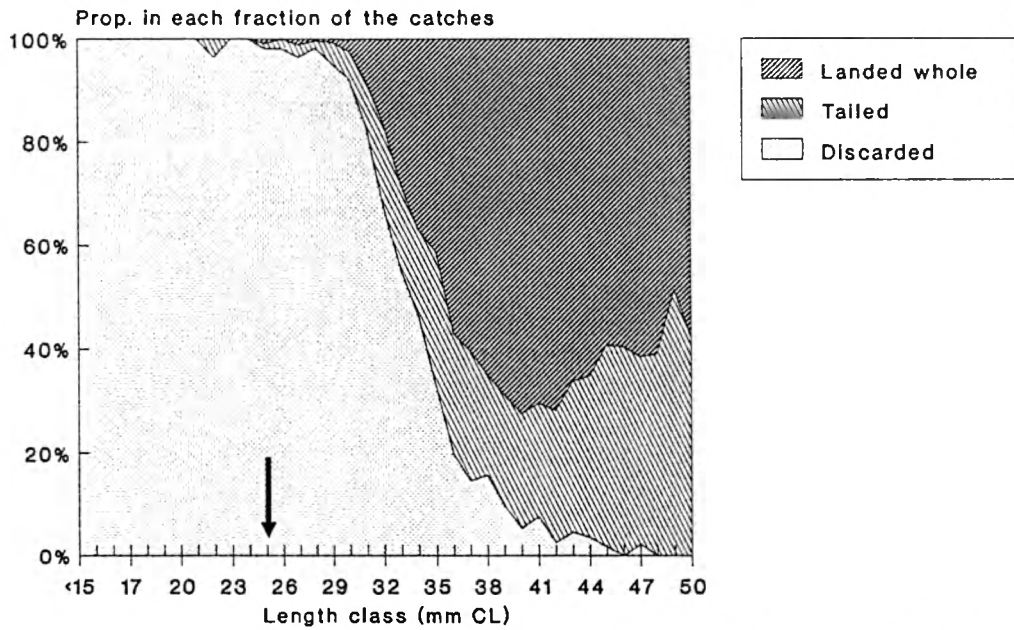
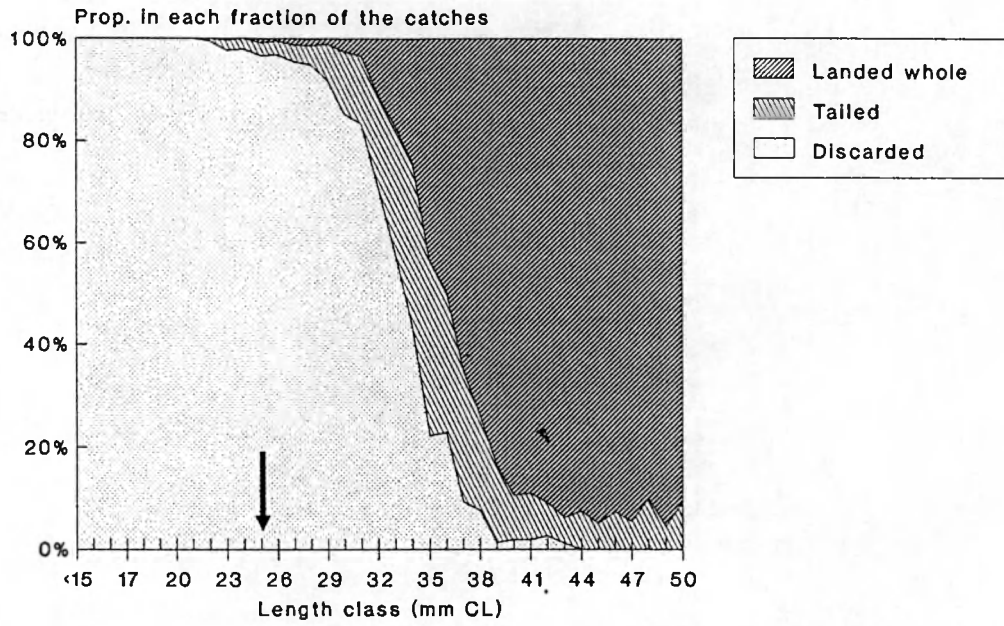


Figure 5.2.149.

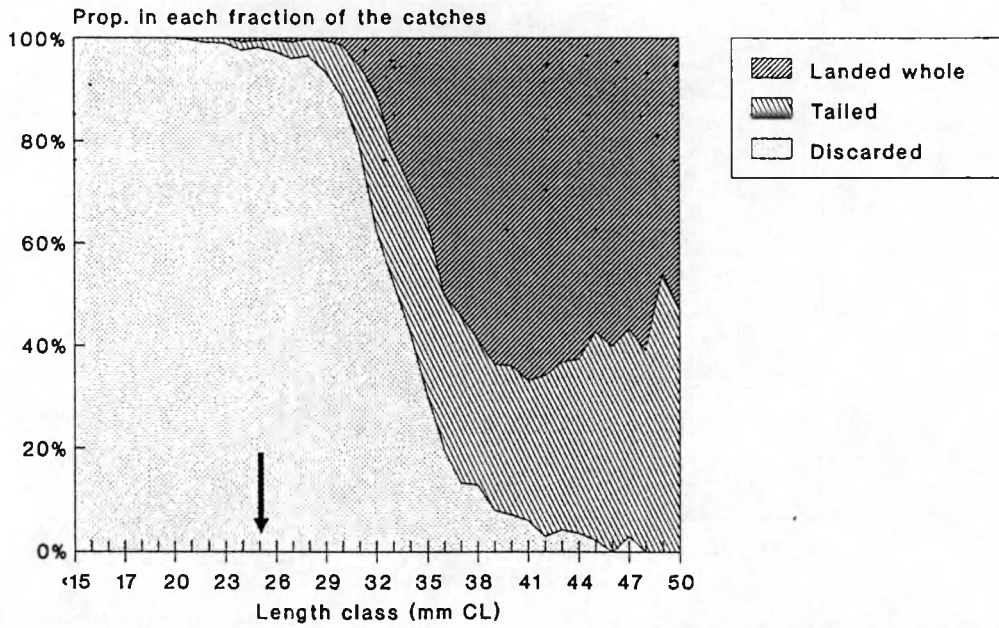
Nephrops discards study
 Proportional composition of catches
 Campaign 3 : Data sets 1+2+3 : Males



Arrow indicates minimum landing size

Figure 5.2.1.50.

Nephrops discards study
 Proportional composition of catches
 Campaign 3 : Data sets 1+2+3 : Females



Arrow indicates minimum landing size

Figure 5.2.1.51.

Fish landings and discards : Whiting
 Numbers discarded/landed per day
 All campaigns : All data sets

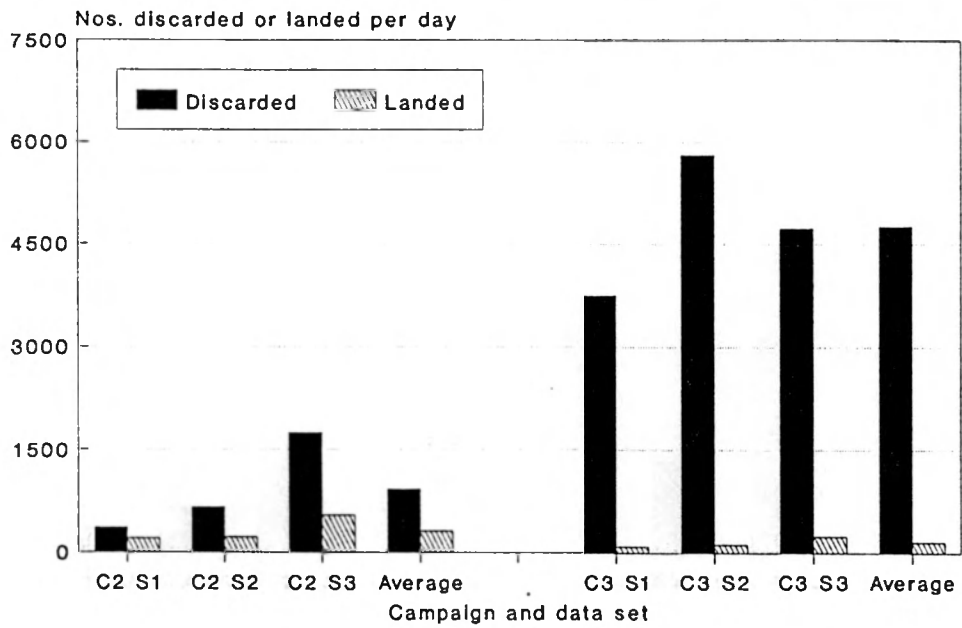


Figure 5.2.2.1.

Fish landings and discards : Cod
 Numbers discarded/landed per day
 All campaigns : All data sets

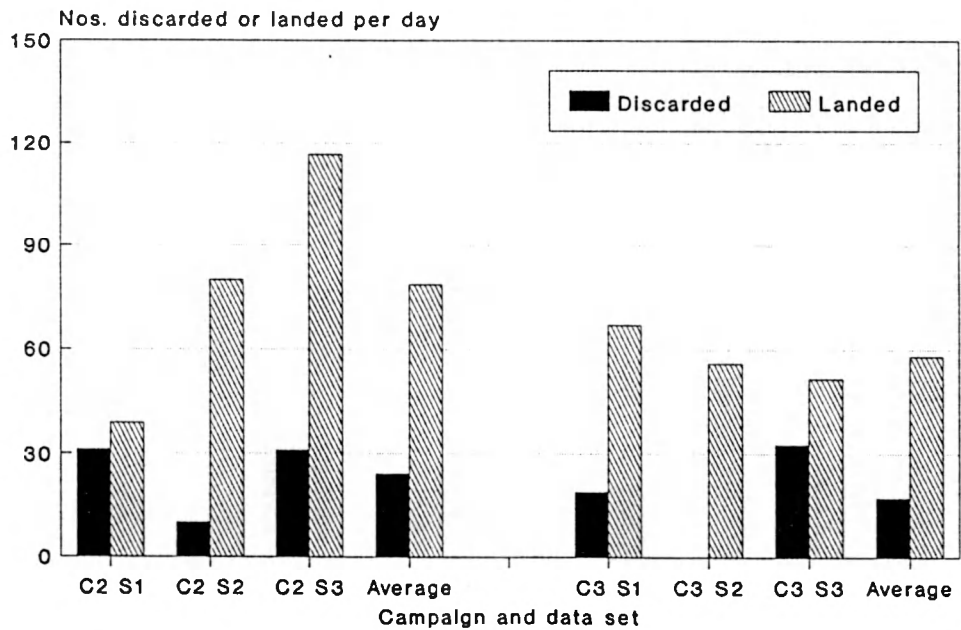


Figure 5.2.2.2.

Fish landings and discards : Gurnards
 Numbers discarded/landed per day
 All campaigns : All data sets

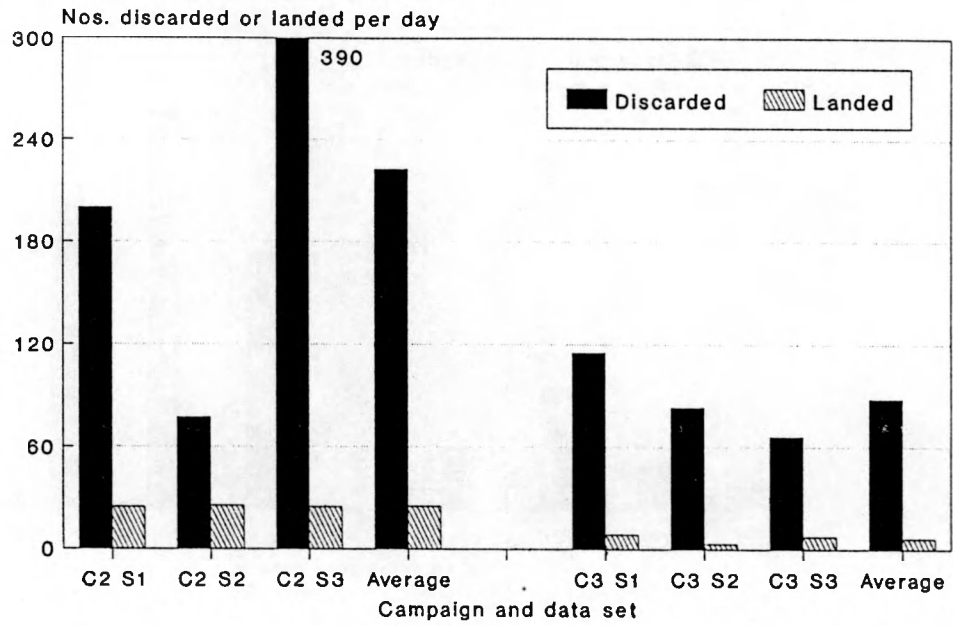


Figure 5.2.2.3.

Fish landings and discards : Dab
 Numbers discarded/landed per day
 All campaigns : All data sets

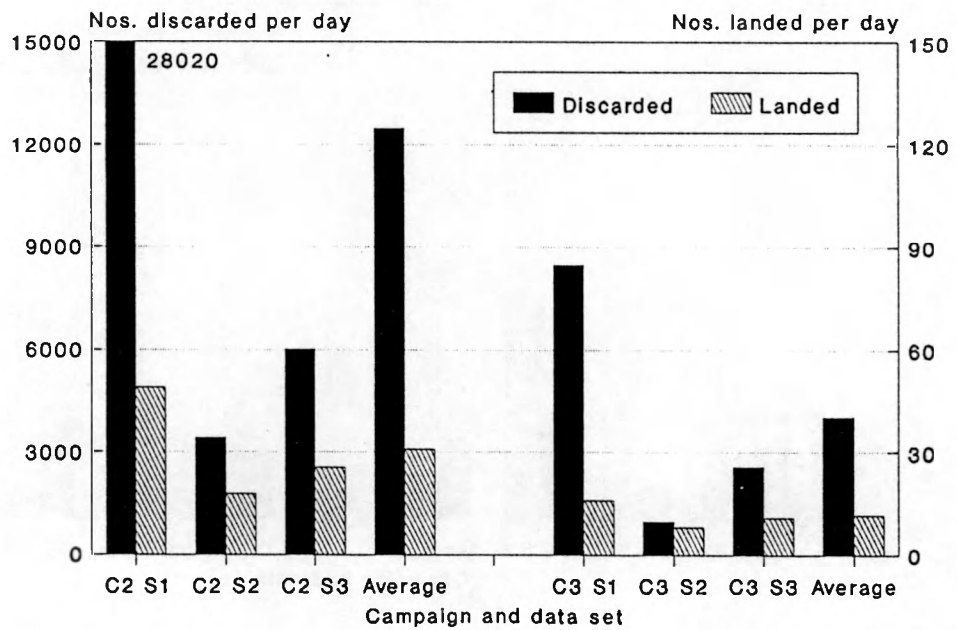


Figure 5.2.2.4.

Fish landings and discards : Plaice
 Numbers discarded/landed per day
 All campaigns : All data sets

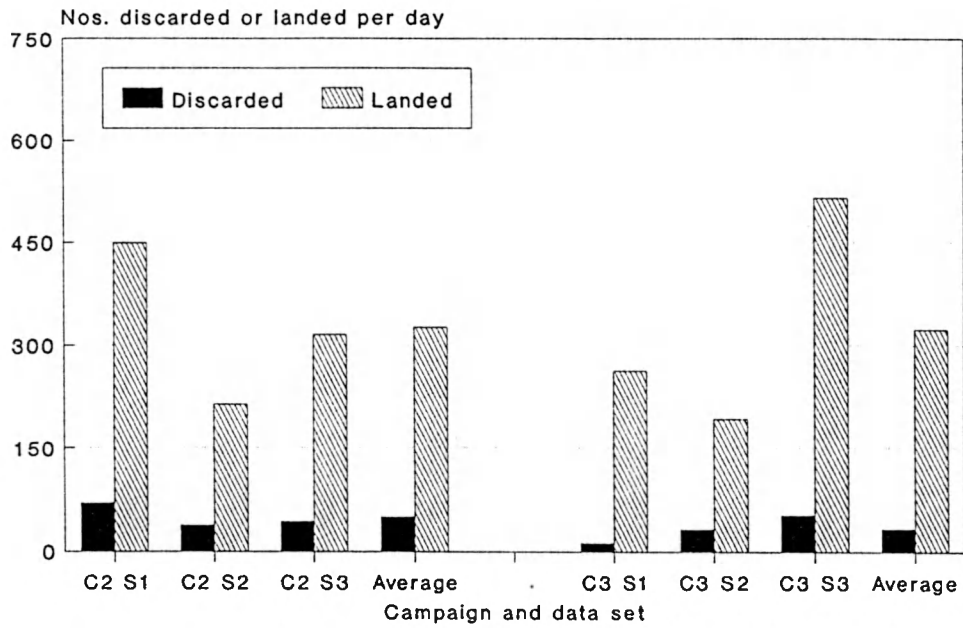


Figure 5.2.2.5.

Fish landings and discards : Sole
 Numbers discarded/landed per day
 All campaigns : All data sets

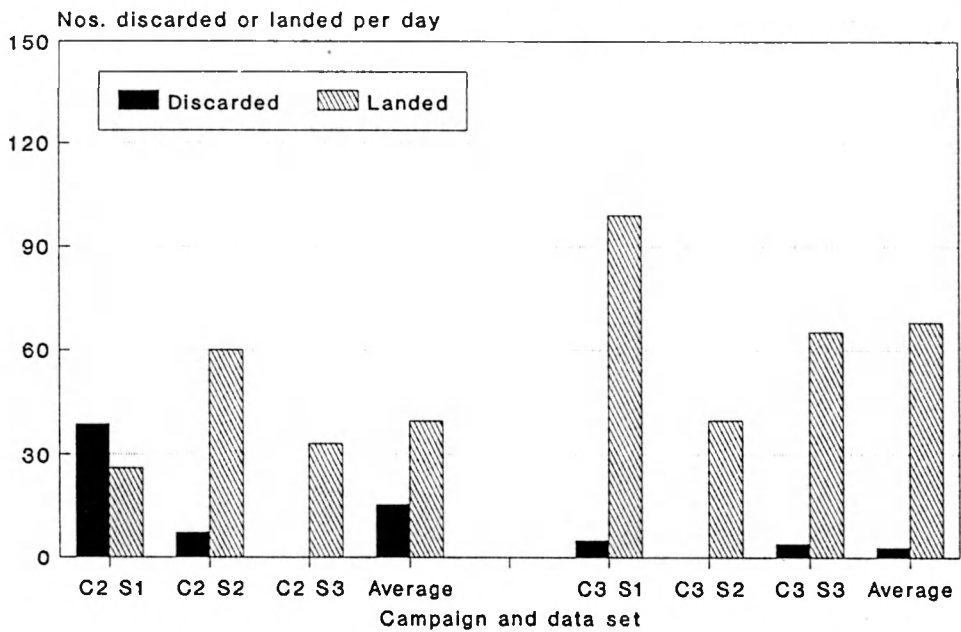
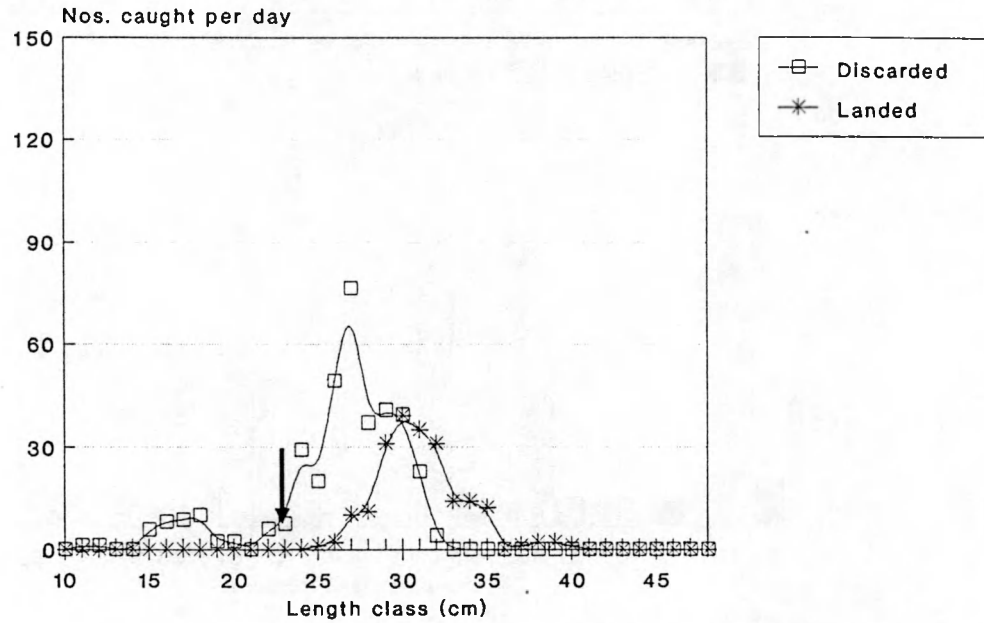


Figure 5.2.2.6.

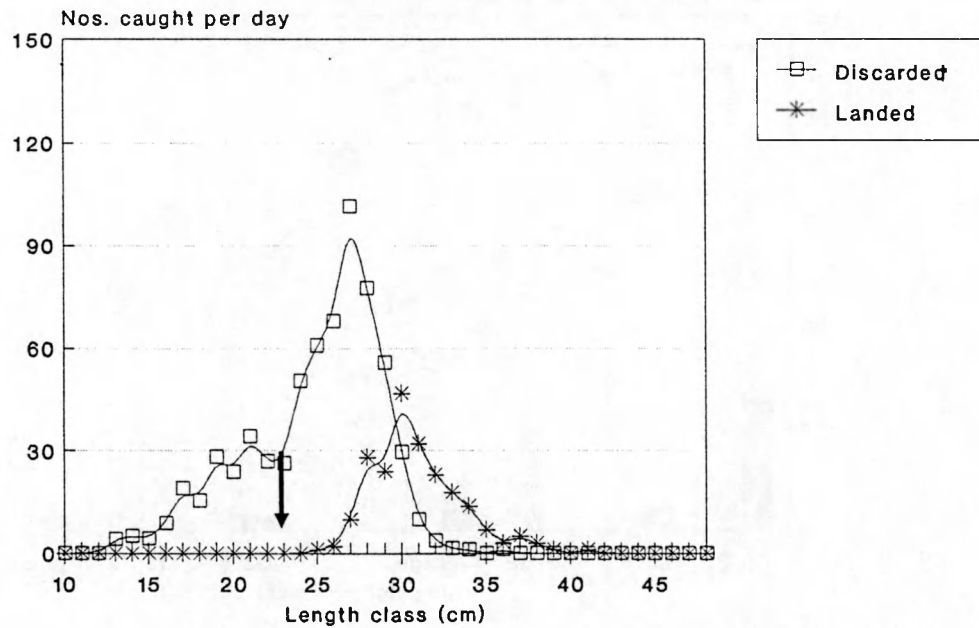
Fish discards study : Whiting
 Numbers caught per day
 Campaign 2 : Data set 1



Arrow indicates minimum landing size

Figure 5.2.2.7.

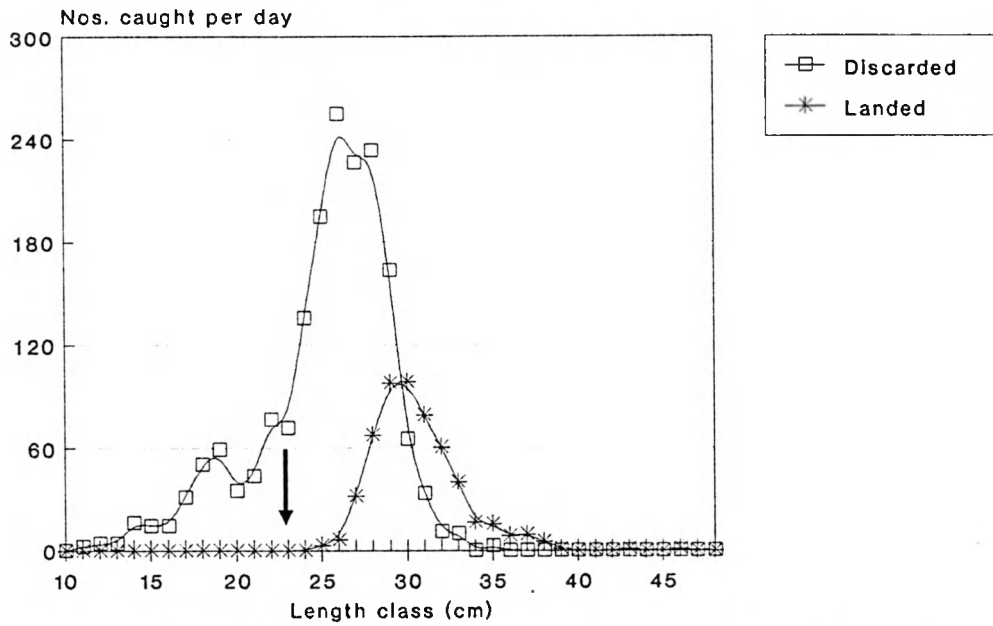
Fish discards study : Whiting
 Numbers caught per day
 Campaign 2 : Data set 2



Arrow indicates minimum landing size

Figure 5.2.2.8.

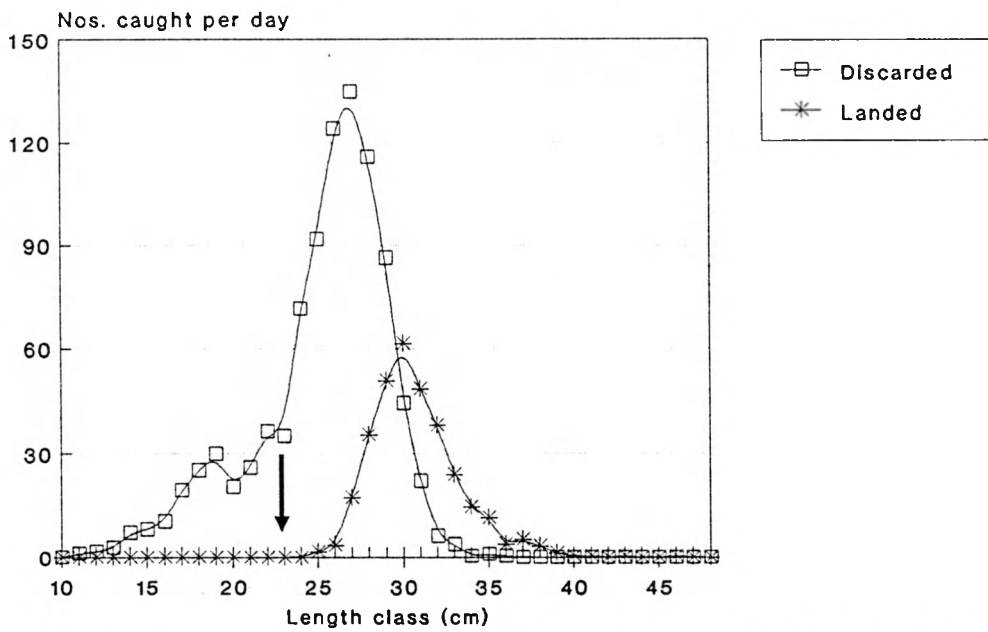
Fish discards study : Whiting
 Numbers caught per day
 Campaign 2 : Data set 3



Arrow indicates minimum landing size

Figure 5.2.2.9.

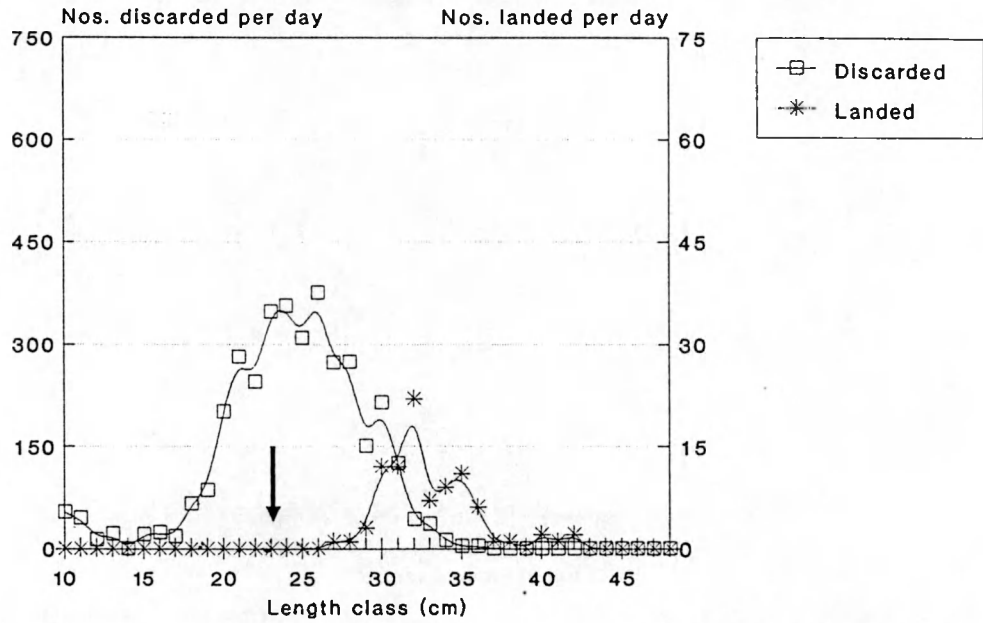
Fish discards study : Whiting
 Numbers caught per day
 Campaign 2 : Data sets 1+2+3



Arrow indicates minimum landing size

Figure 5.2.2.10.

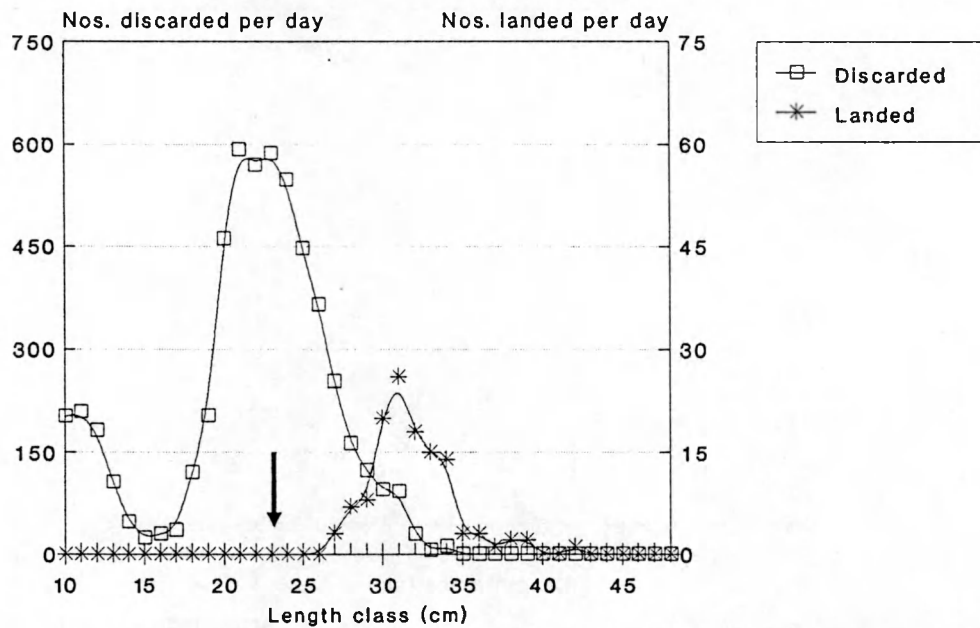
Fish discards study : Whiting
 Numbers caught per day
 Campaign 3 : Data set 1



Arrow indicates minimum landing size

Figure 5.2.2.11.

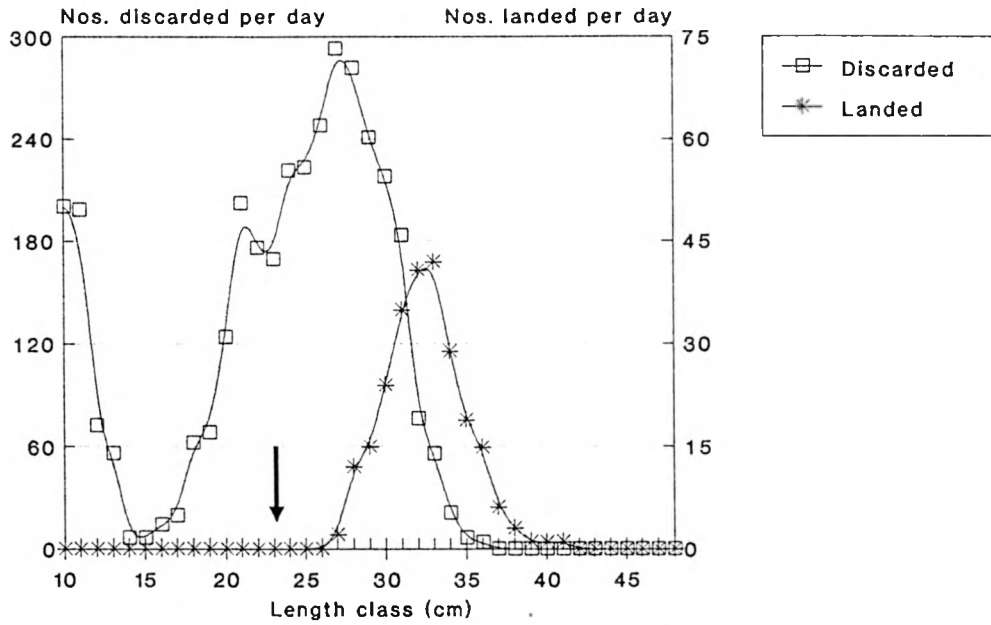
Fish discards study : Whiting
 Numbers caught per day
 Campaign 3 : Data set 2



Arrow indicates minimum landing size

Figure 5.2.2.12.

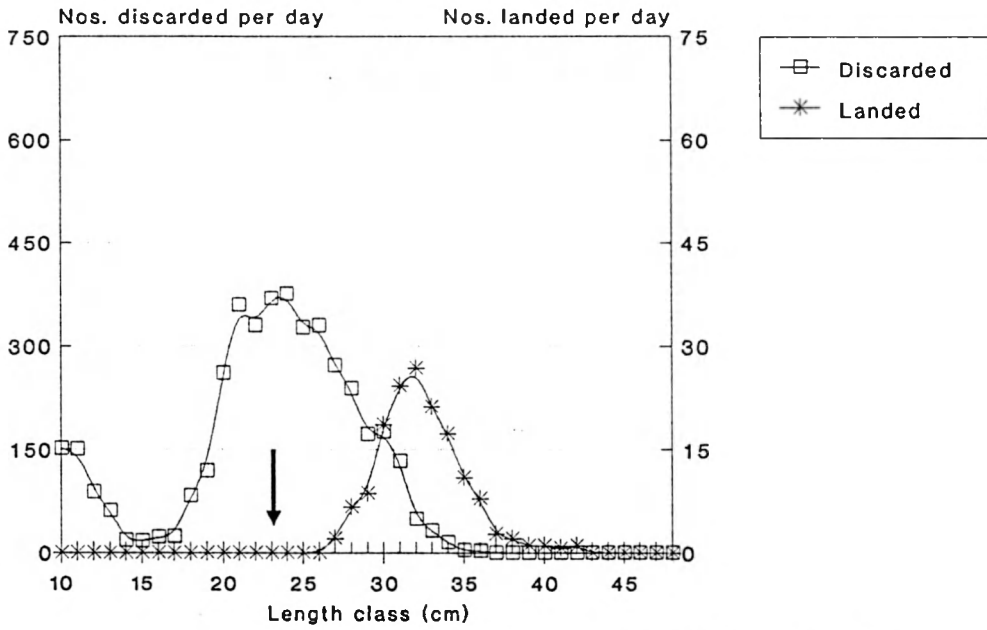
Fish discards study : Whiting
 Numbers caught per day
 Campaign 3 : Data set 3



Arrow indicates minimum landing size

Figure 5.2.2.13.

Fish discards study : Whiting
 Numbers caught per day
 Campaign 3 : Data sets 1+2+3



Arrow indicates minimum landing size

Figure 5.2.2.14.

Fish discards study : Cod
 Numbers caught per day
 Campaign 2 : Data sets 1+2+3

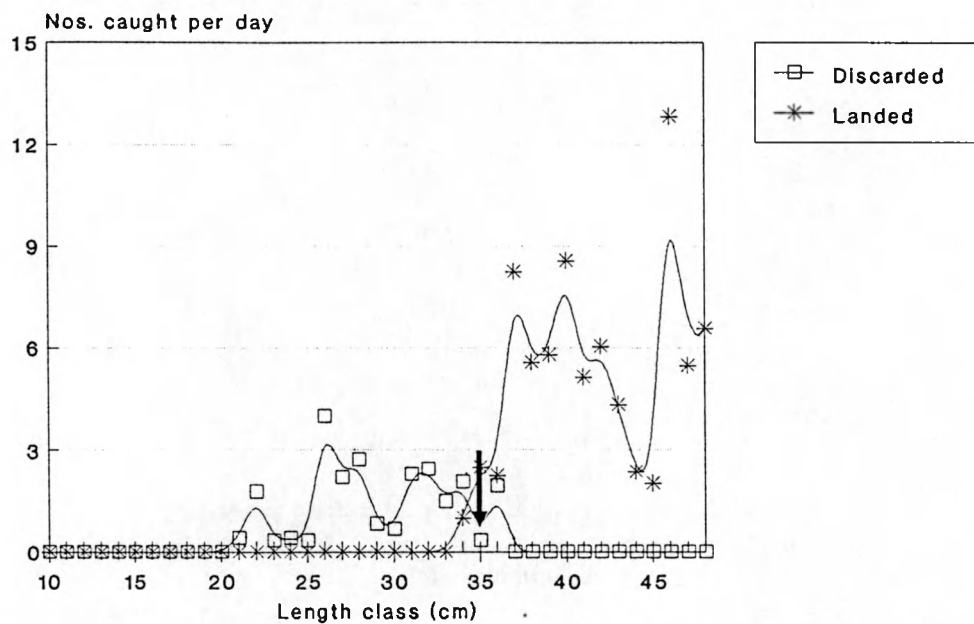


Figure 5.2.2.15.

Arrow indicates minimum landing size

Fish discards study : Cod
 Numbers caught per day
 Campaign 3 : Data sets 1+2+3

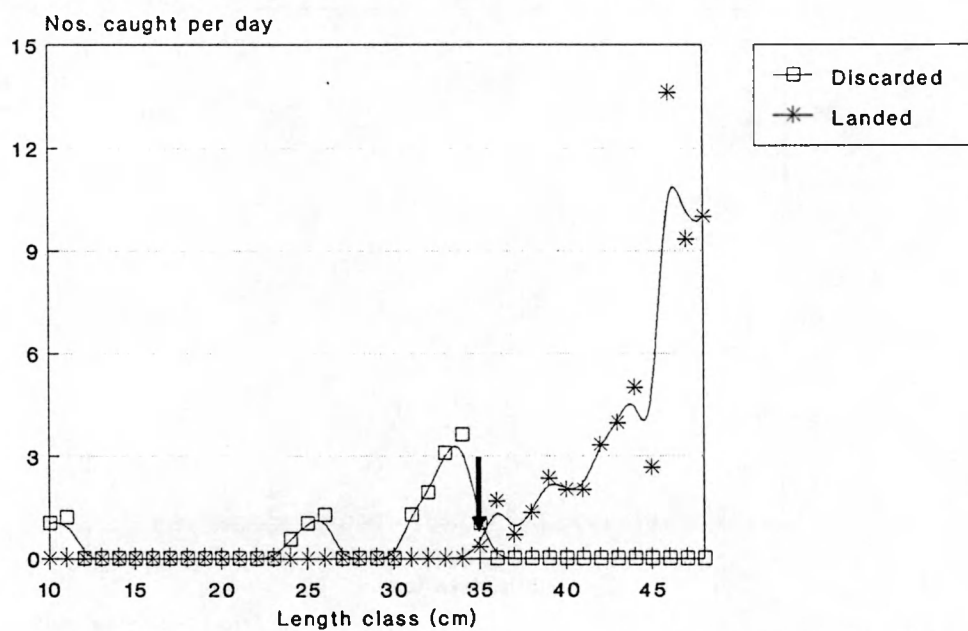
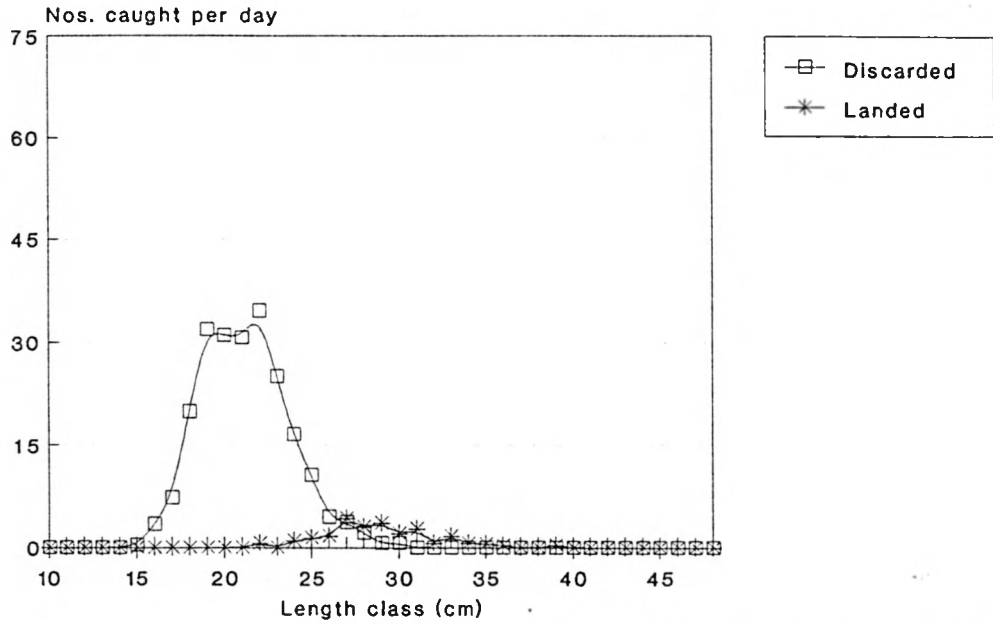


Figure 5.2.2.16.

Arrow indicates minimum landing size

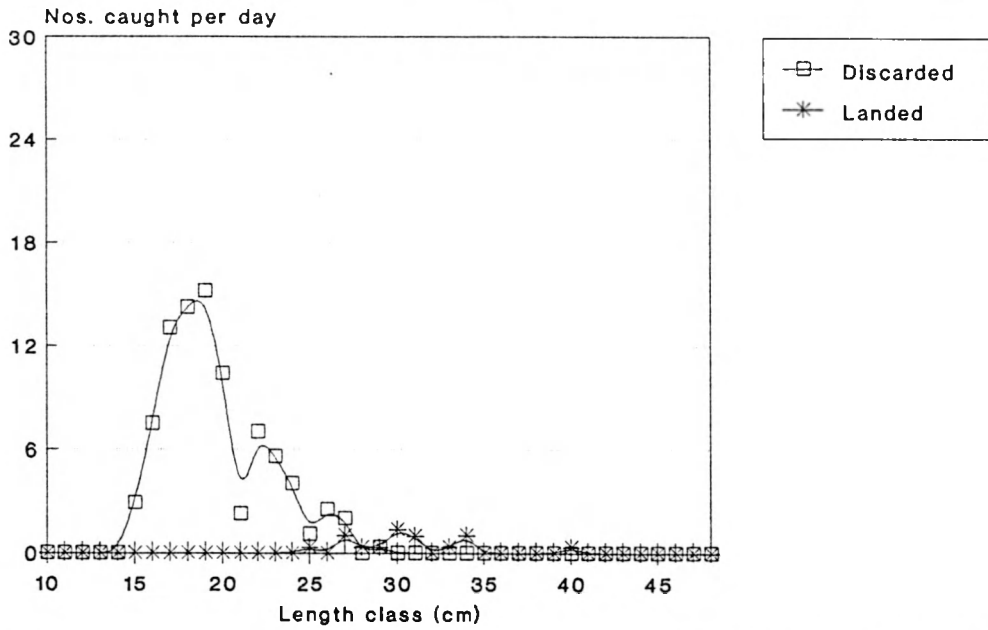
Fish discards study : Gurnards
 Numbers caught per day
 Campaign 2 : Data sets 1+2+3



There is no MLS for gurnards

Figure 5.2.2.17.

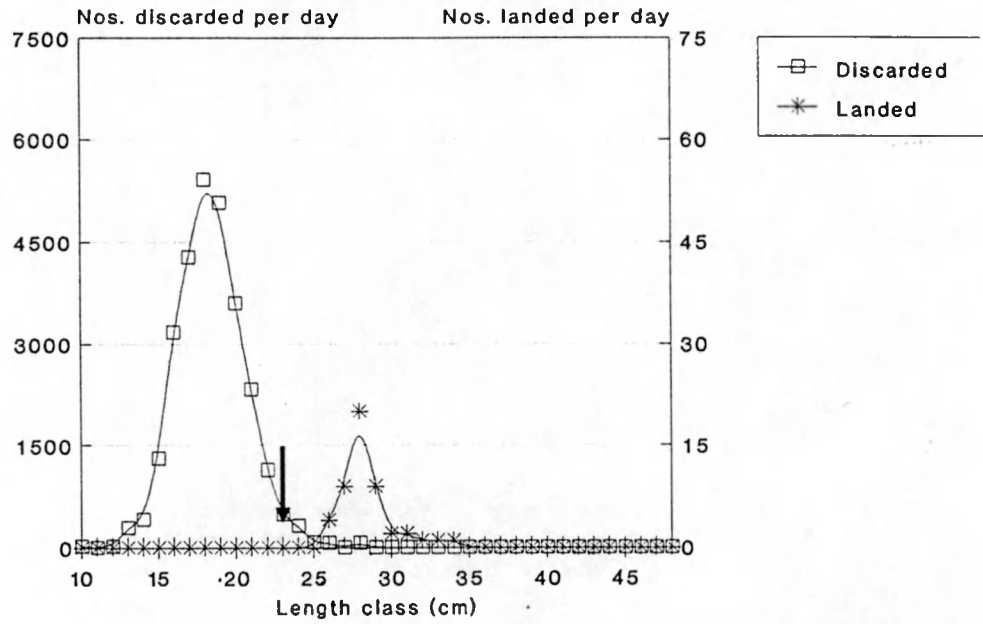
Fish discards study : Gurnards
 Numbers caught per day
 Campaign 3 : Data sets 1+2+3



There is no MLS for gurnards

Figure 5.2.2.18.

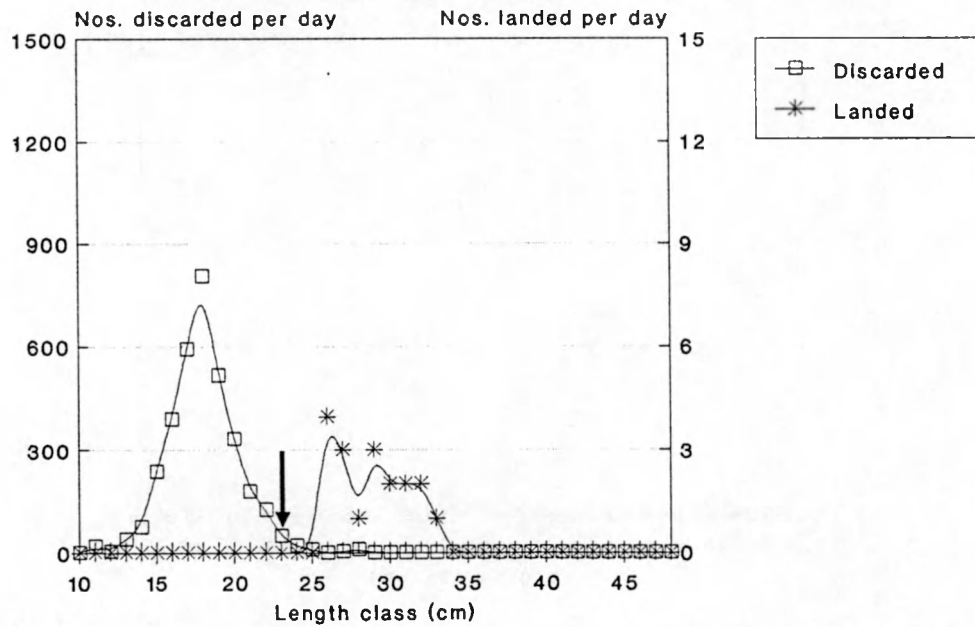
Fish discards study : Dab
 Numbers caught per day
 Campaign 2 : Data set 1



Arrow indicates minimum landing size

Figure 5.2.2.19.

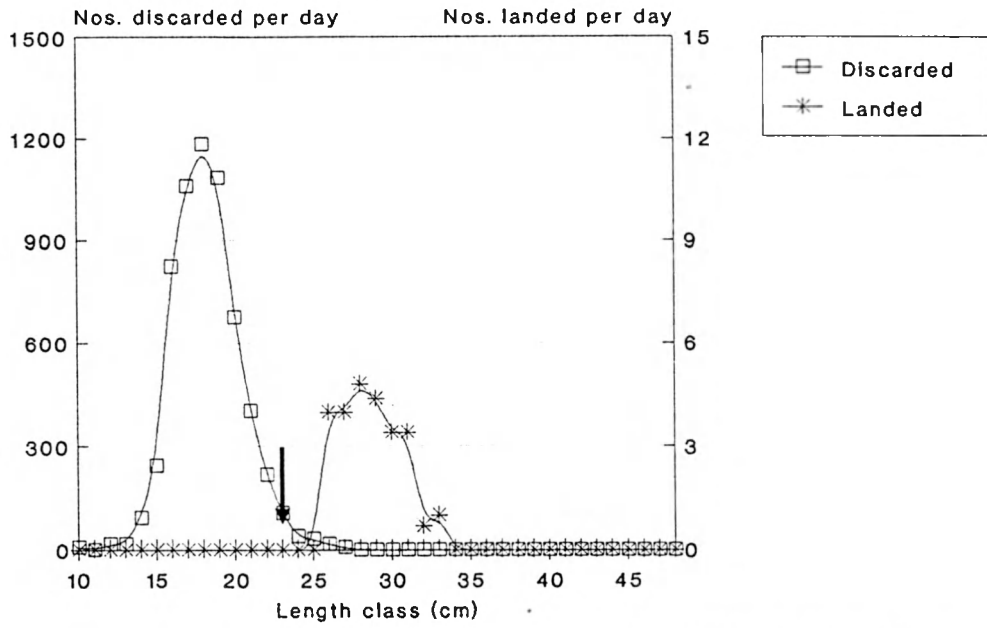
Fish discards study : Dab
 Numbers caught per day
 Campaign 2 : Data set 2



Arrow indicates minimum landing size

Figure 5.2.2.20.

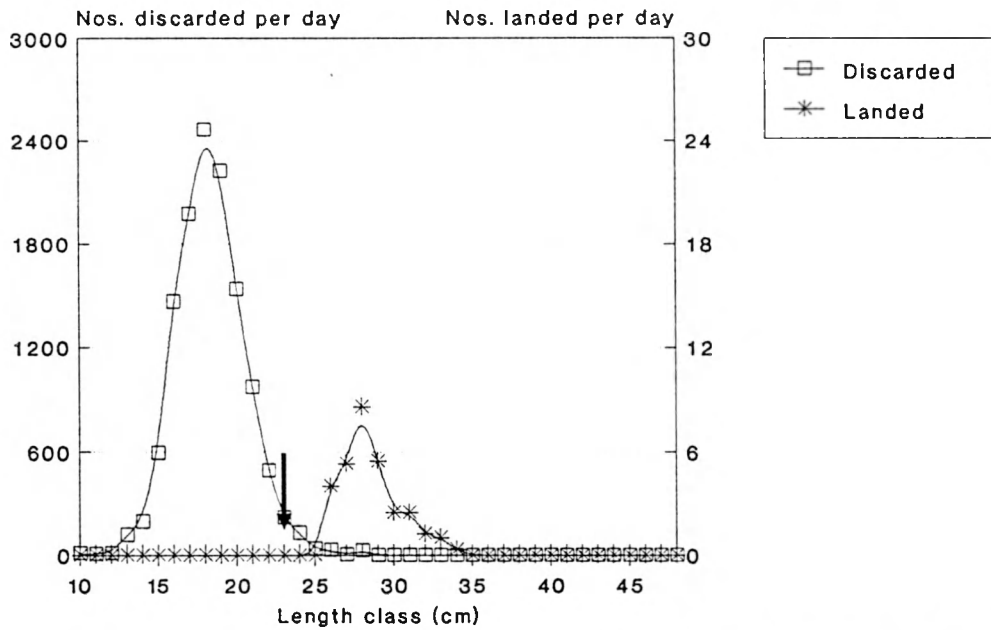
Fish discards study : Dab
 Numbers caught per day
 Campaign 2 : Data set 3



Arrow indicates minimum landing size

Figure 5.2.2.21.

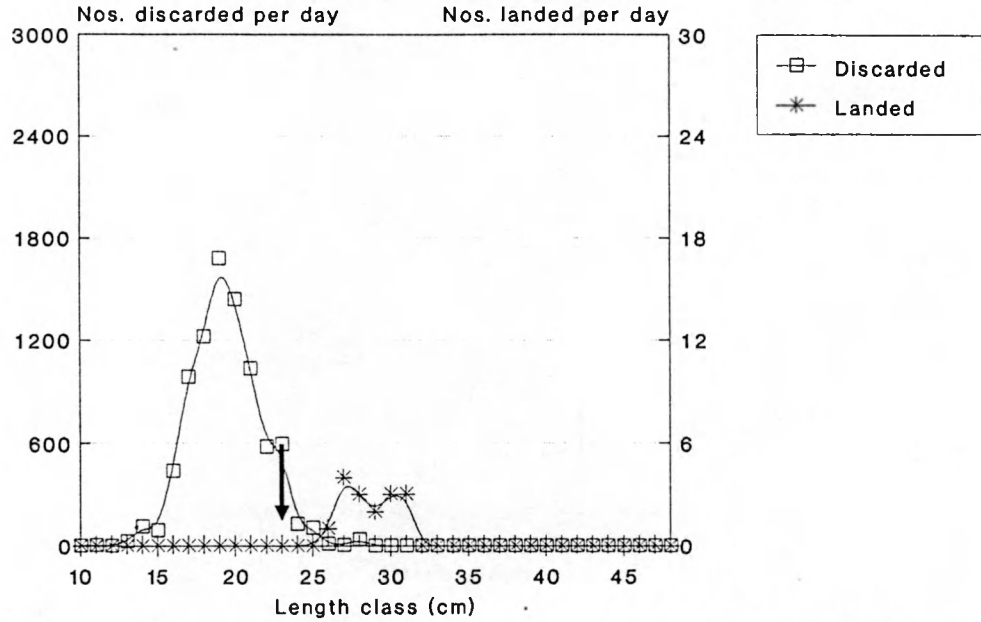
Fish discards study : Dab
 Numbers caught per day
 Campaign 2 : Data sets 1+2+3



Arrow indicates minimum landing size

Figure 5.2.2.22.

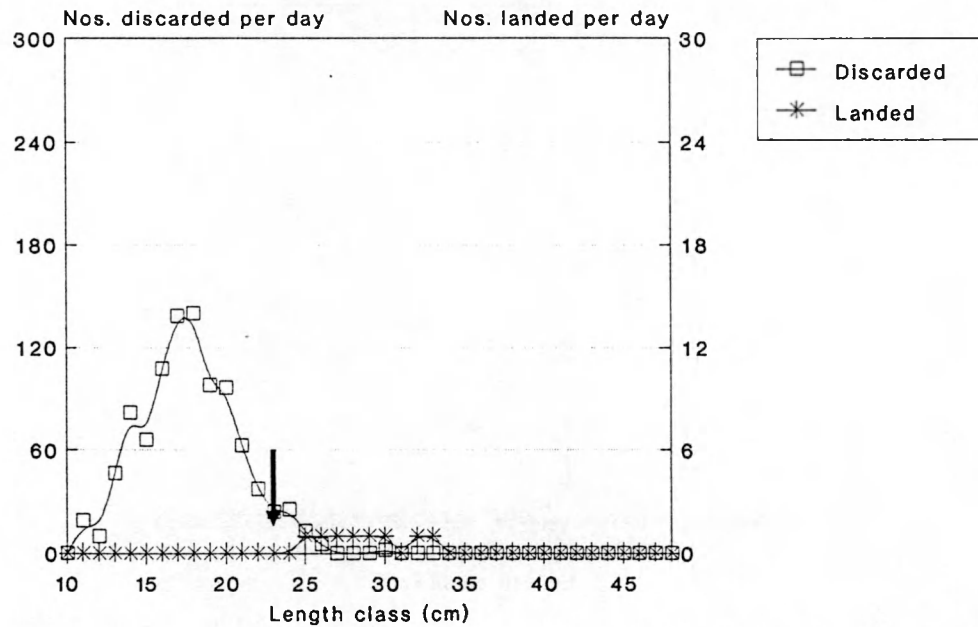
Fish discards study : Dab
 Numbers caught per day
 Campaign 3 : Data set 1



Arrow indicates minimum landing size

Figure 5.2.2.23.

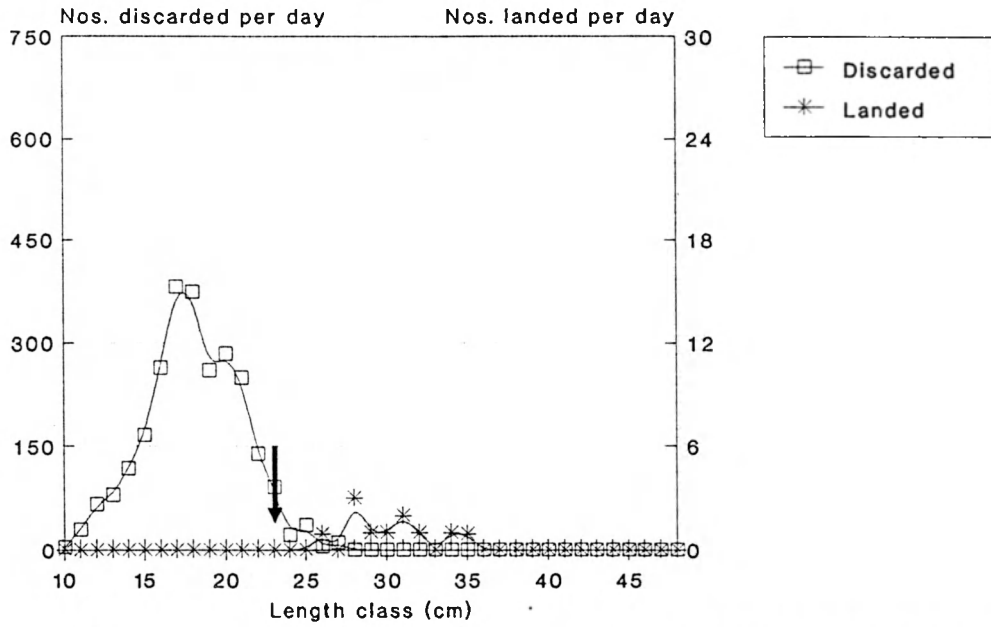
Fish discards study : Dab
 Numbers caught per day
 Campaign 3 : Data set 2



Arrow indicates minimum landing size

Figure 5.2.2.24.

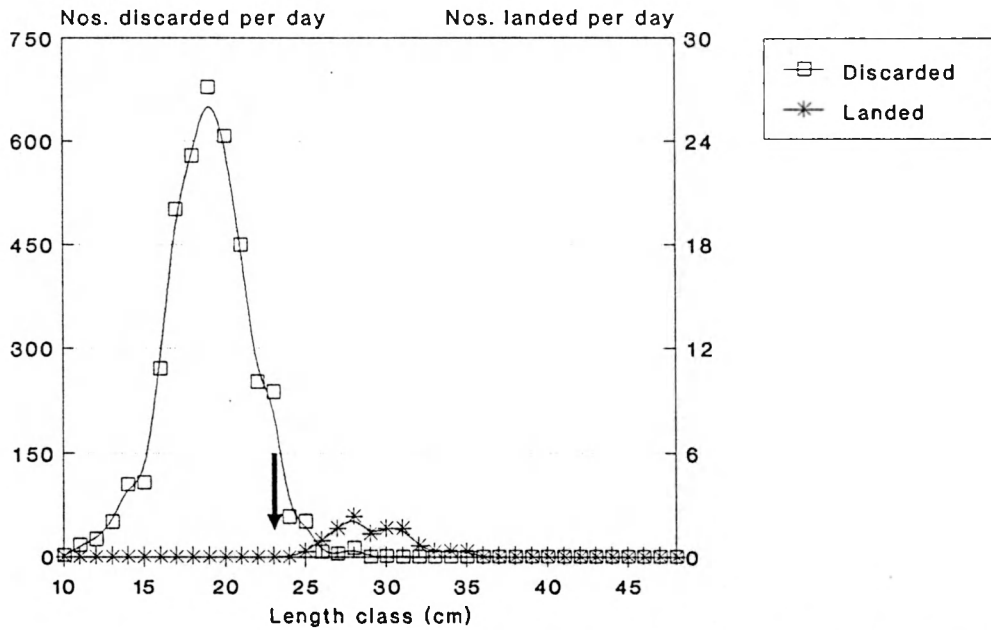
Fish discards study : Dab
 Numbers caught per day
 Campaign 3 : Data set 3



Arrow indicates minimum landing size

Figure 5.2.2.25.

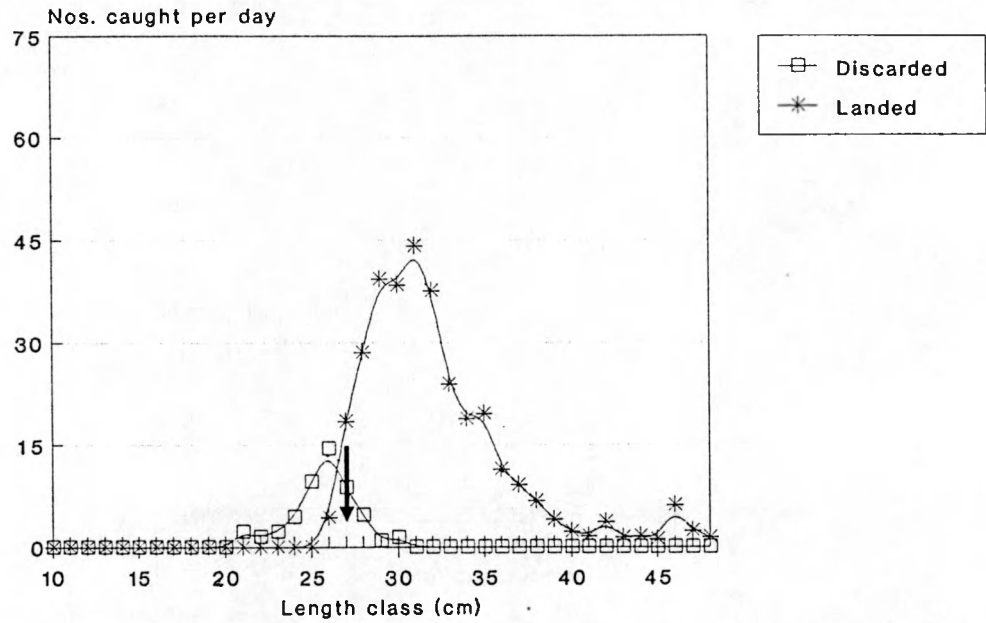
Fish discards study : Dab
 Numbers caught per day
 Campaign 3 : Data sets 1+2+3



Arrow indicates minimum landing size

Figure 5.2.2.26.

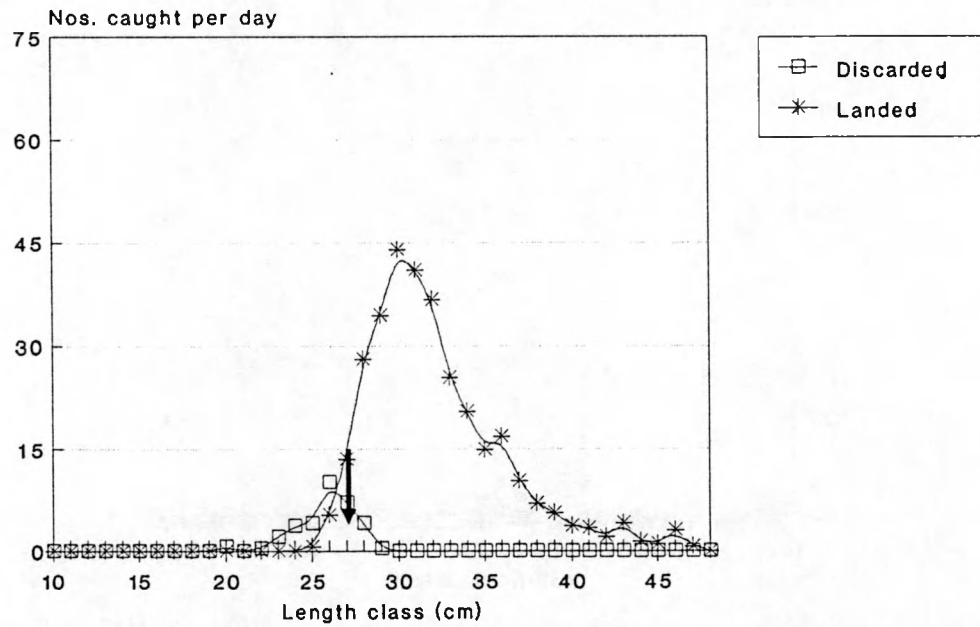
Fish discards study : Plaice
 Numbers caught per day
 Campaign 2 : Data sets 1+2+3



Arrow indicates minimum landing size

Figure 5.2.2.27.

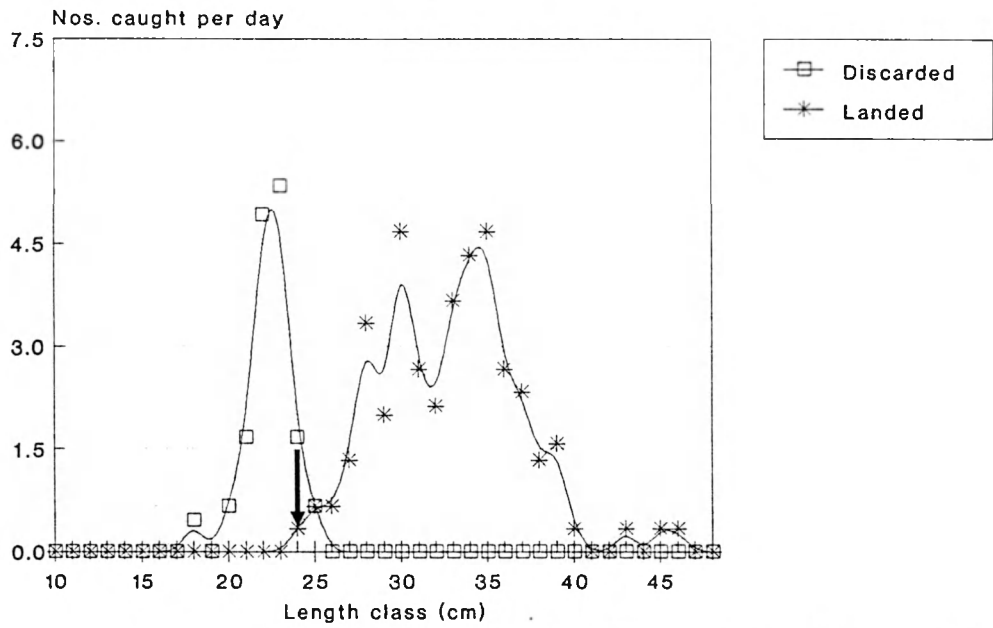
Fish discards study : Plaice
 Numbers caught per day
 Campaign 3 : Data sets 1+2+3



Arrow indicates minimum landing size

Figure 5.2.2.28.

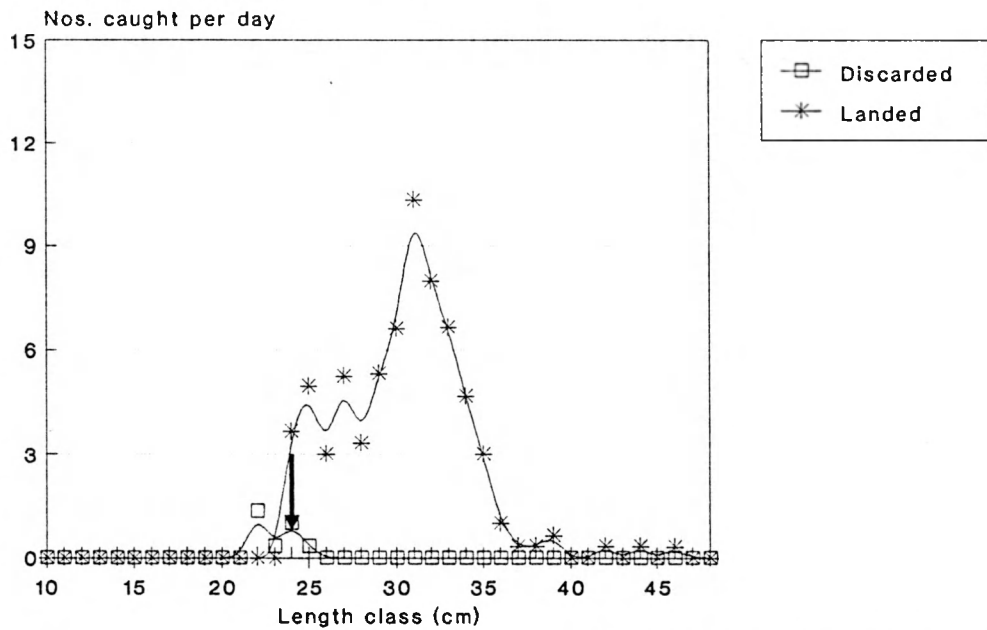
Fish discards study : Sole
 Numbers caught per day
 Campaign 2 : Data sets 1+2+3



Arrow indicates minimum landing size

Figure 5.2.2.29.

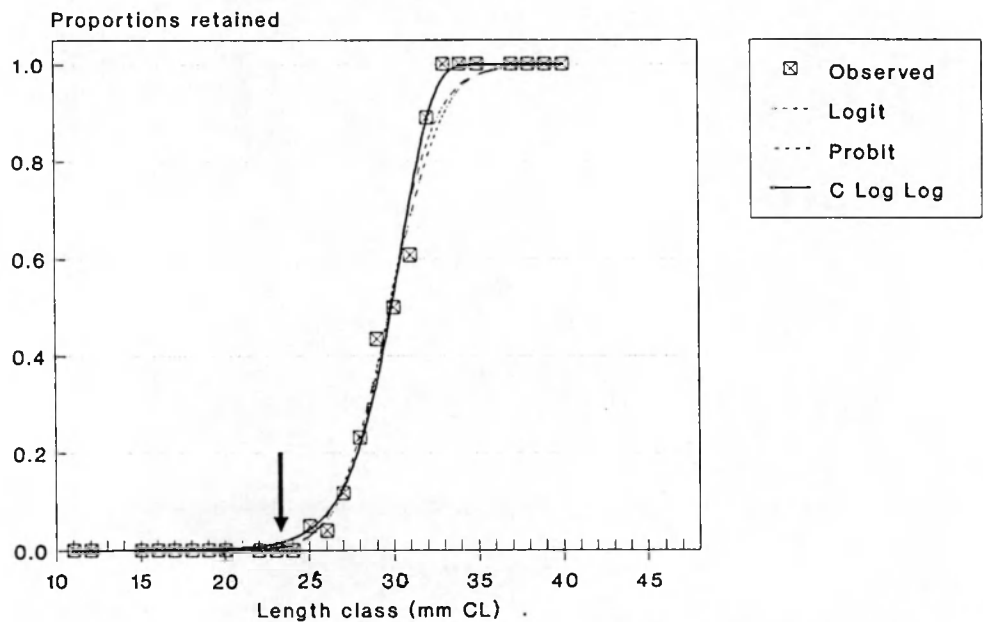
Fish discards study : Sole
 Numbers caught per day
 Campaign 3 : Data sets 1+2+3



Arrow indicates minimum landing size

Figure 5.2.2.30.

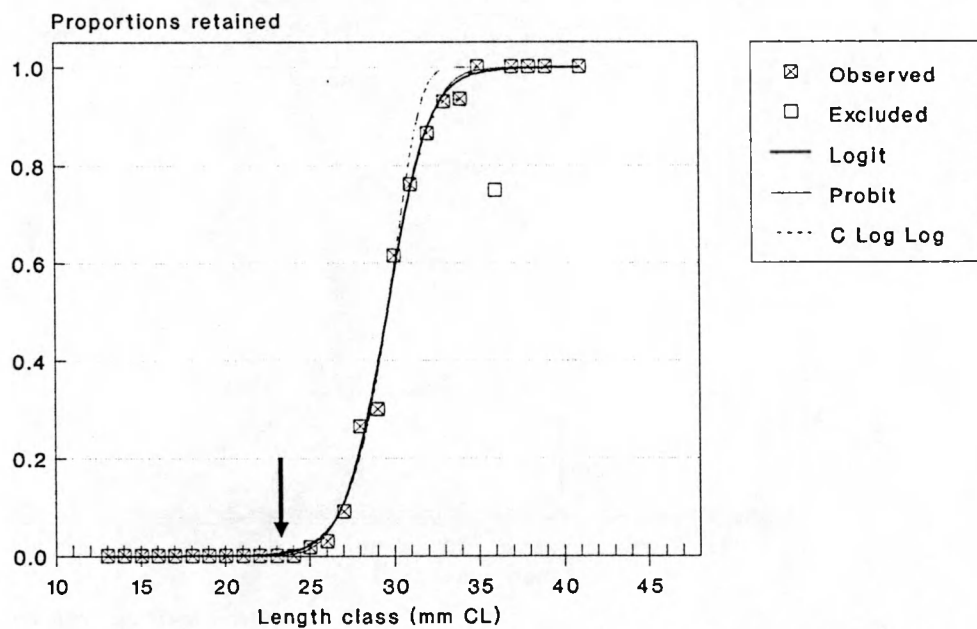
Fishermen's selection : Whiting
 Selection curve fitting
 Campaign 2 : Data set 1



Arrow indicates minimum landing size

Figure 5.2.2.31.

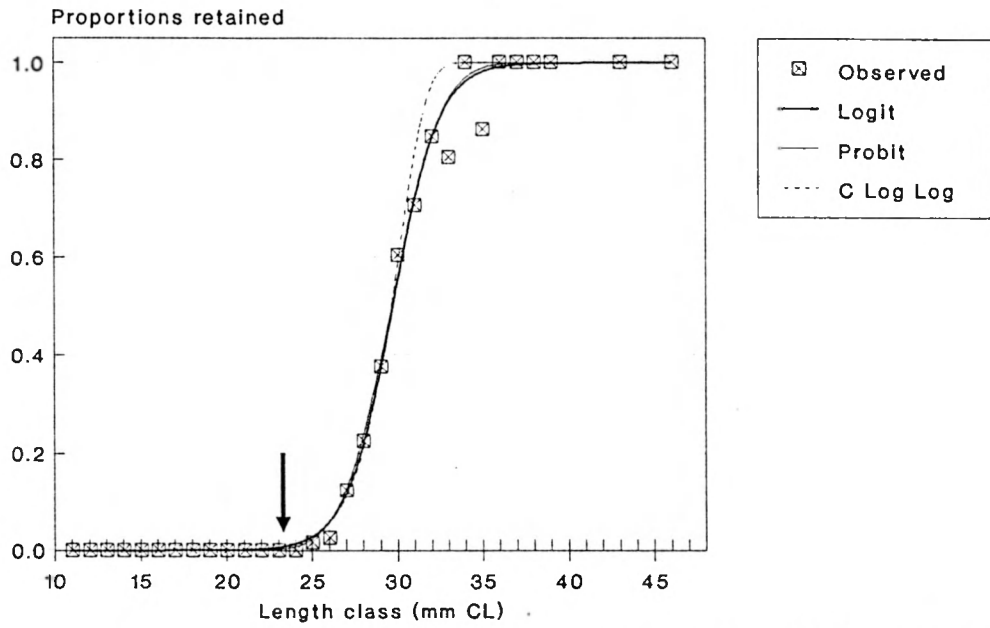
Fishermen's selection : Whiting
 Selection curve fitting
 Campaign 2 : Data set 2



Arrow indicates minimum landing size

Figure 5.2.2.32.

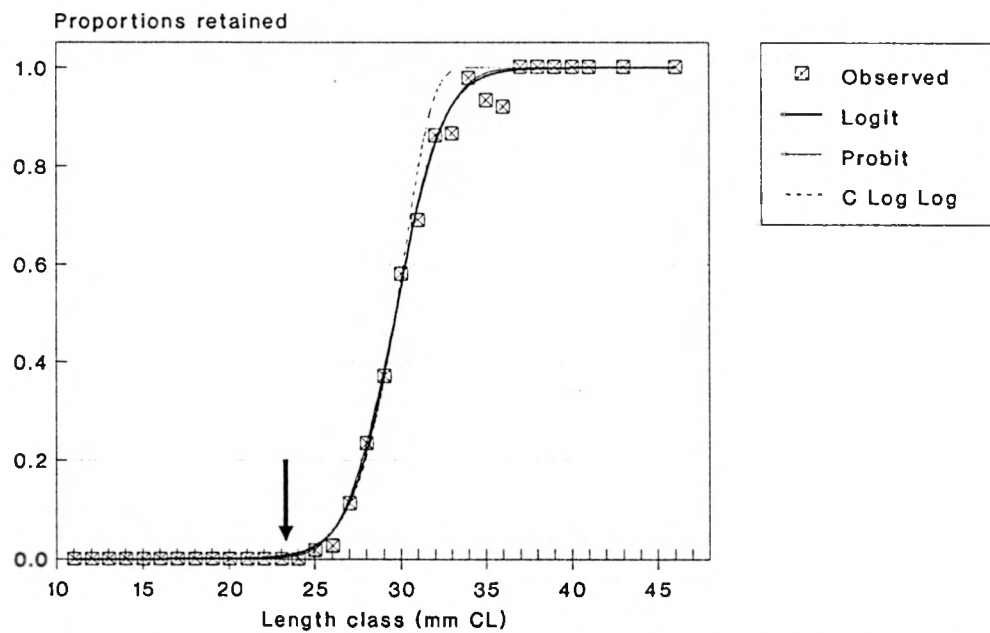
Fishermen's selection : Whiting
 Selection curve fitting
 Campaign 2 : Data set 3



Arrow indicates minimum landing size

Figure 5.2.2.33.

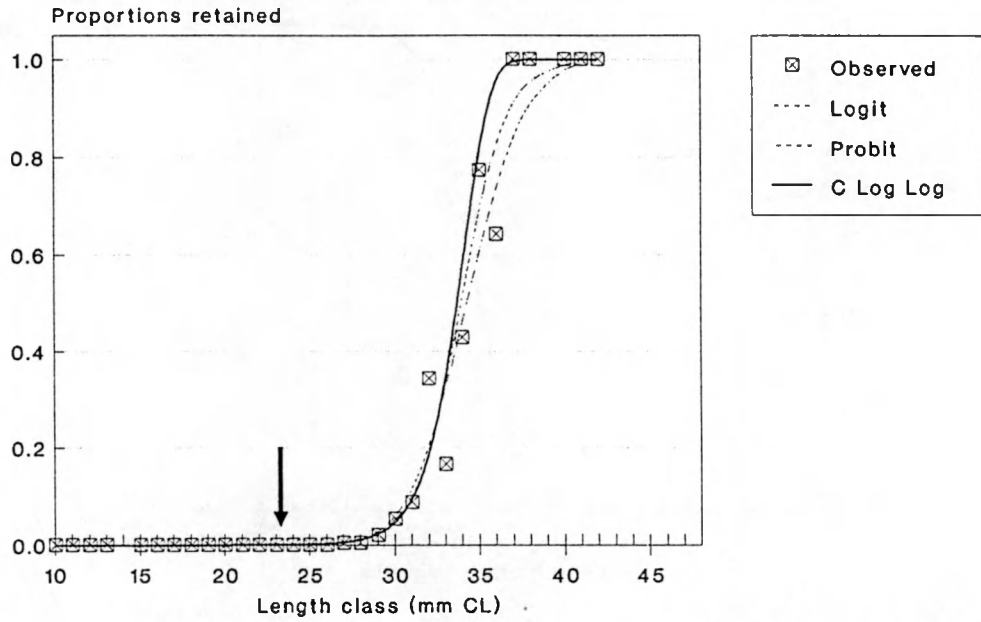
Fishermen's selection : Whiting
 Selection curve fitting
 Campaign 2 : Data sets 1+2+3



Arrow indicates minimum landing size

Figure 5.2.2.34.

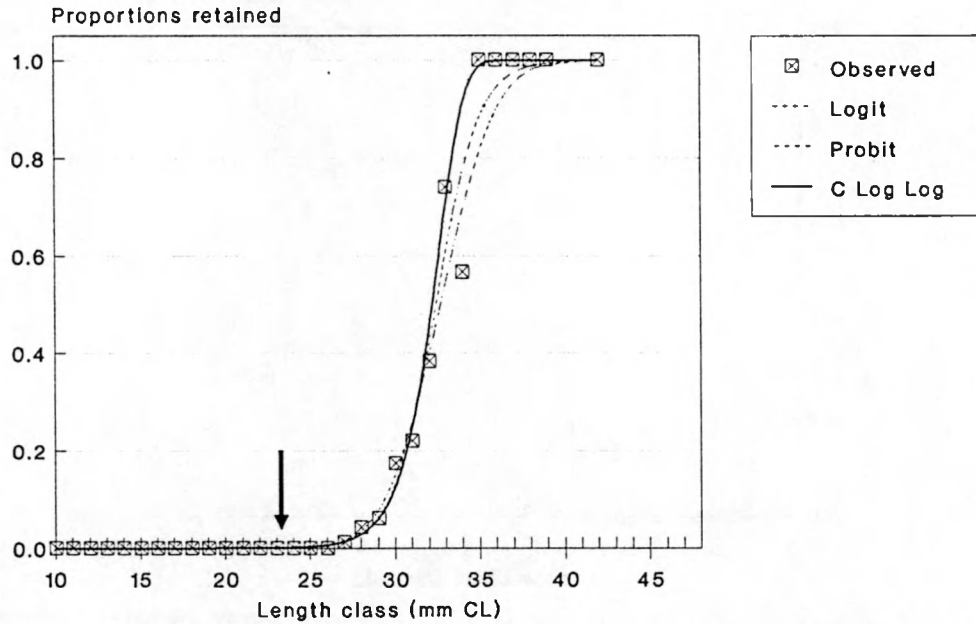
Fishermen's selection : Whiting
 Selection curve fitting
 Campaign 3 : Data set 1



Arrow indicates minimum landing size

Figure 5.2.2.35.

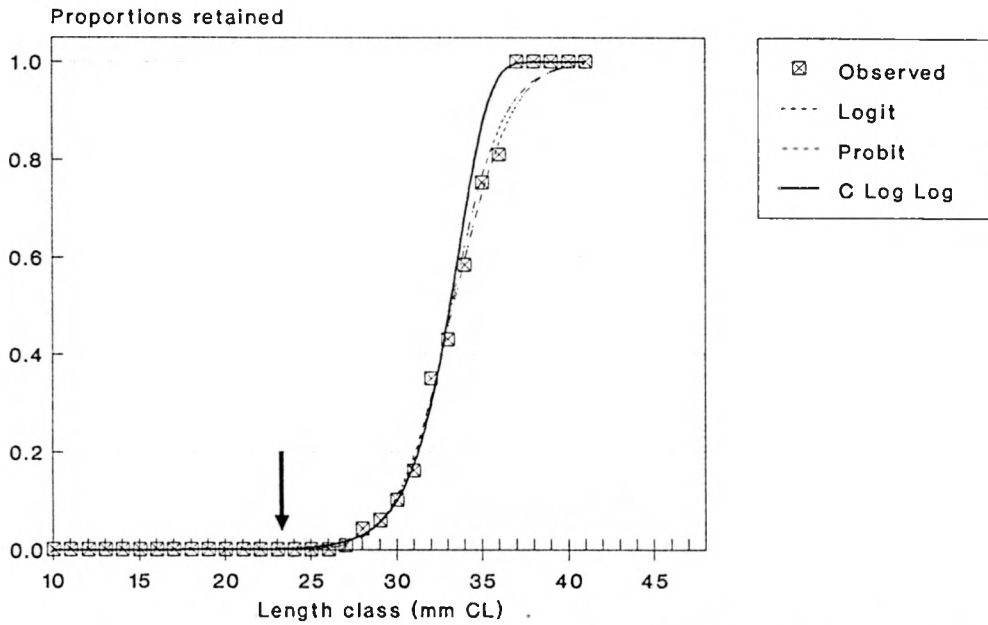
Fishermen's selection : Whiting
 Selection curve fitting
 Campaign 3 : Data set 2



Arrow indicates minimum landing size

Figure 5.2.2.36.

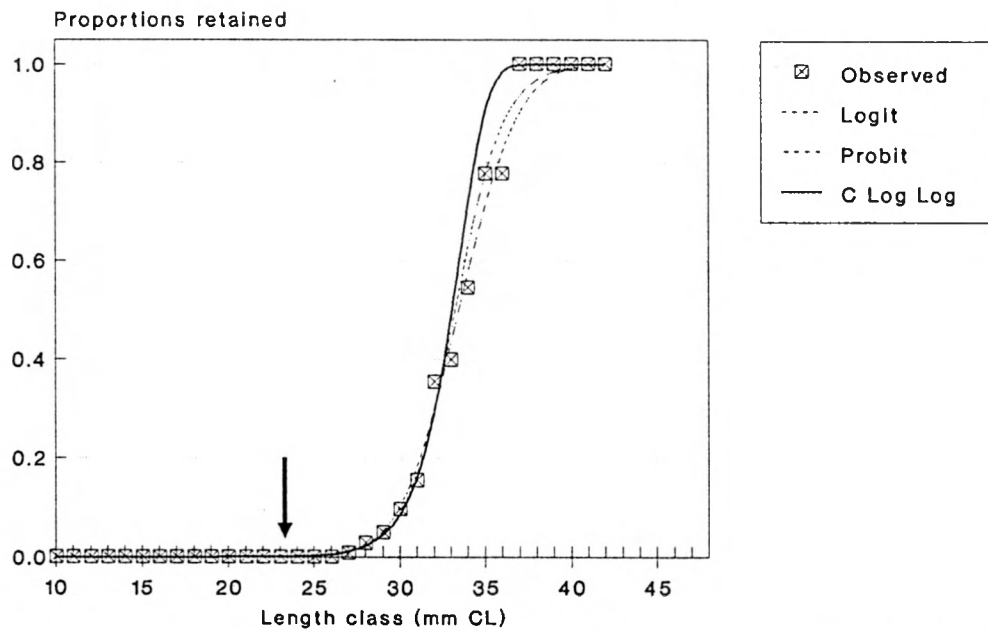
Fishermen's selection : Whiting
 Selection curve fitting
 Campaign 3 : Data set 3



Arrow indicates minimum landing size

Figure 5.2.2.37.

Fishermen's selection : Whiting
 Selection curve fitting
 Campaign 3 : Data sets 1+2+3



Arrow indicates minimum landing size

Figure 5.2.2.38.

Fishermen's selection : Whiting
Selection curve fitting
Comparative study Camp. 2 vs. Camp. 3

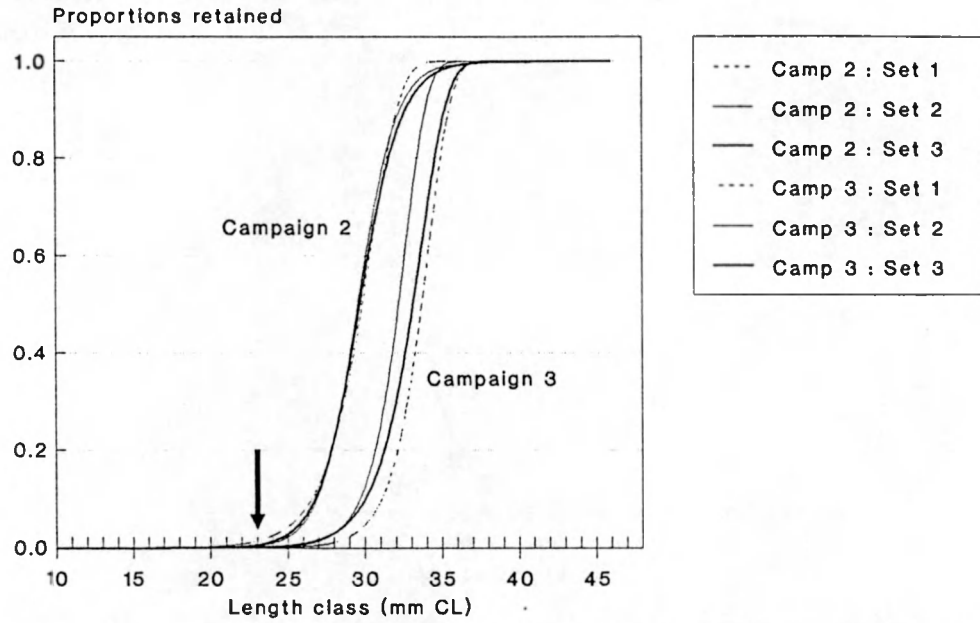
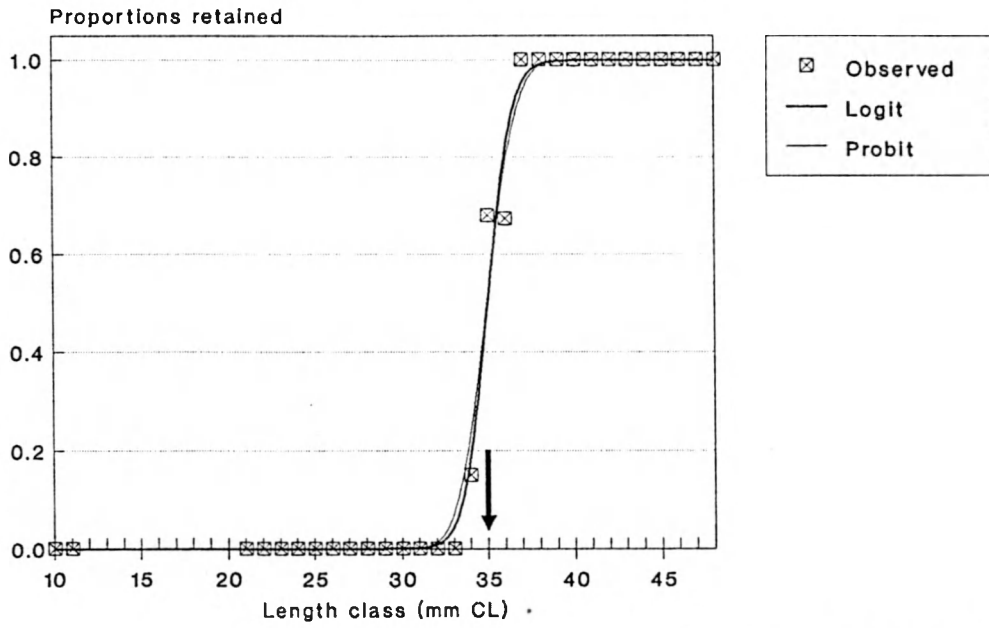


Figure 5.2.2.39.

Arrow indicates minimum landing size

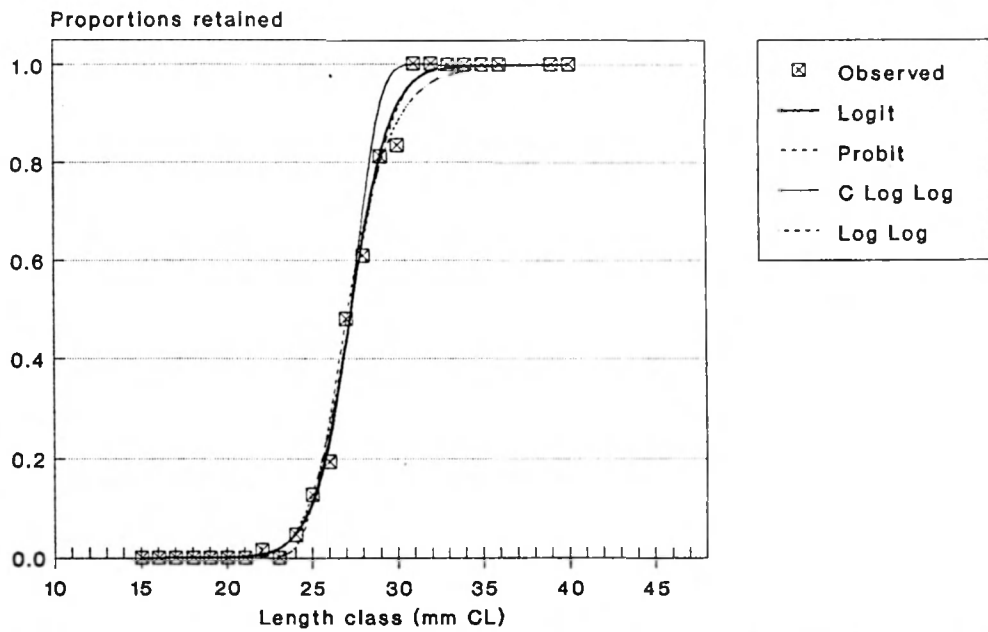
Fishermen's selection : Cod
 Selection curve fitting
 Campaigns 2+3 : All data sets combined



Arrow indicates minimum landing size

Figure 5.2.2.40.

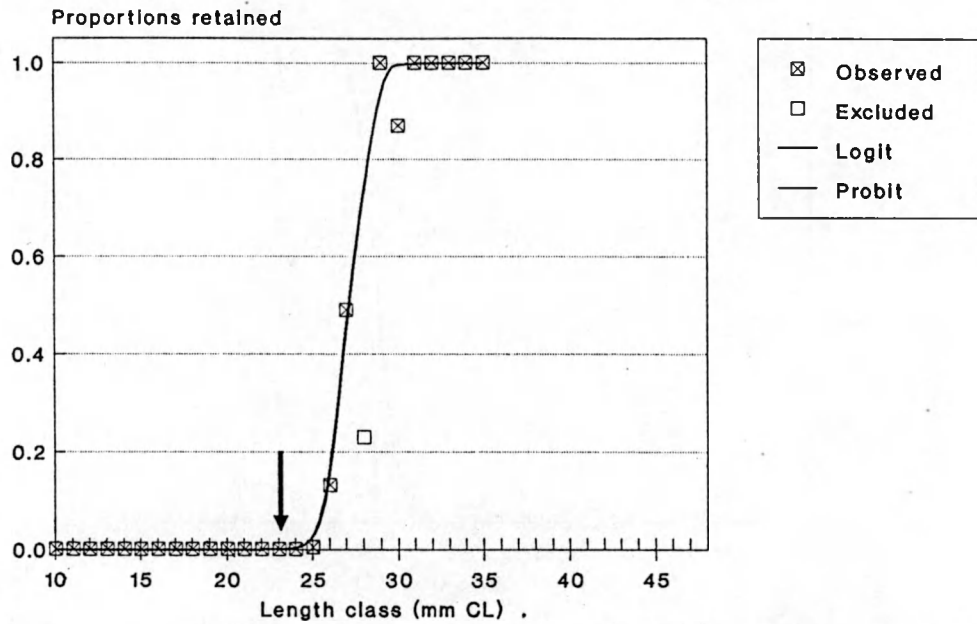
Fishermen's selection : Gurnards
 Selection curve fitting
 Campaigns 2+3 : All data sets combined



There is no MLS for gurnards

Figure 5.2.2.41.

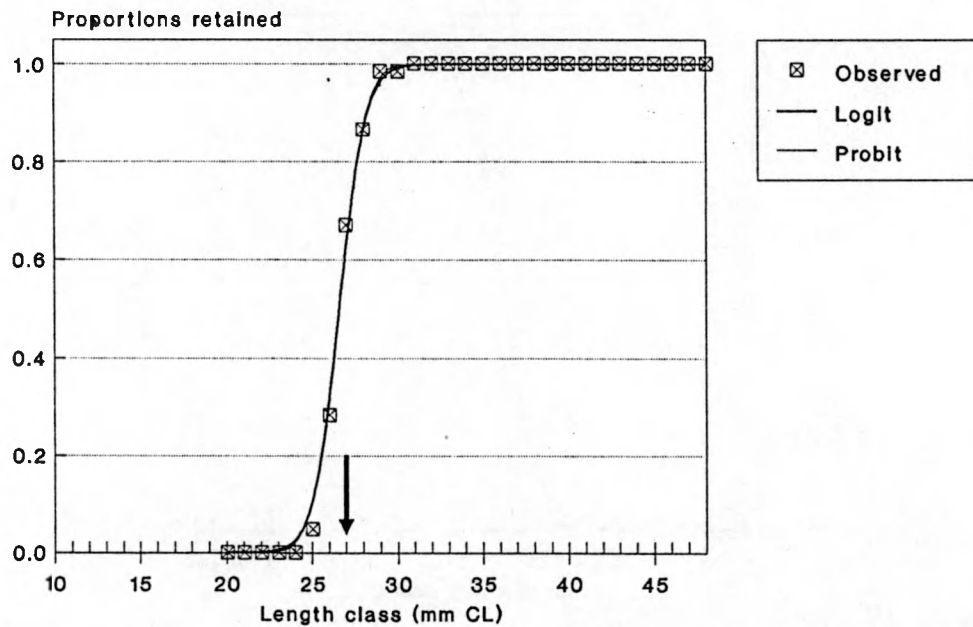
Fishermen's selection : Dab
 Selection curve fitting
 Campaigns 2+3 : All data sets combined



Arrow indicates minimum landing size

Figure 5.2.2.42.

Fishermen's selection : Plaice
 Selection curve fitting
 Campaigns 2+3 : All data sets combined



Arrow indicates minimum landing size

Figure 5.2.2.43.

Fishermen's selection : Sole
Selection curve fitting
Campaigns 2+3 : All data sets combined

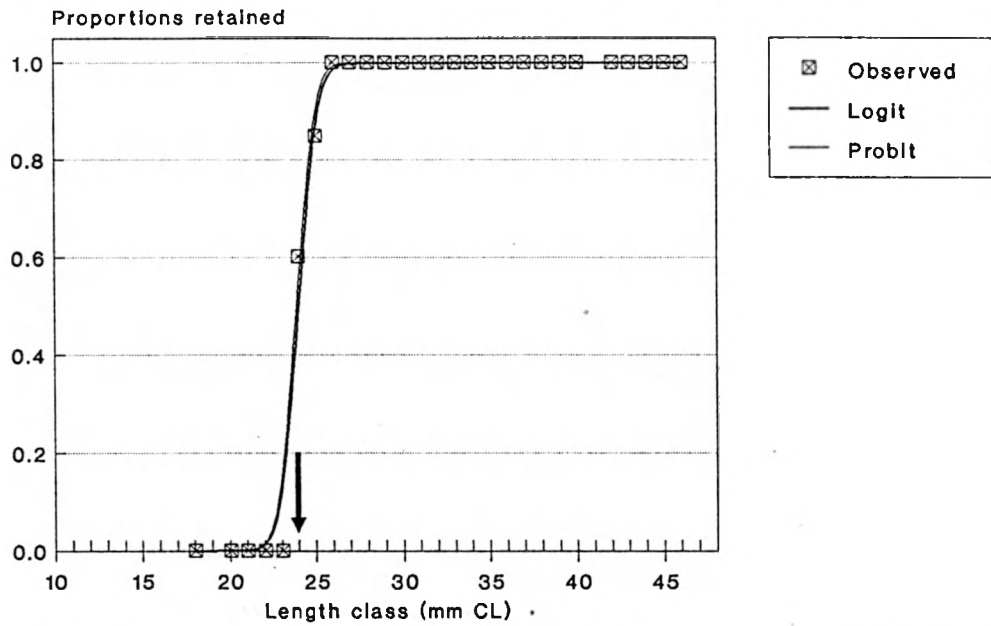


Figure 5.2.2.44.

Arrow indicates minimum landing size

Nephrops : Discard survival experiments
Size distributions of samples
Experiments 1-5

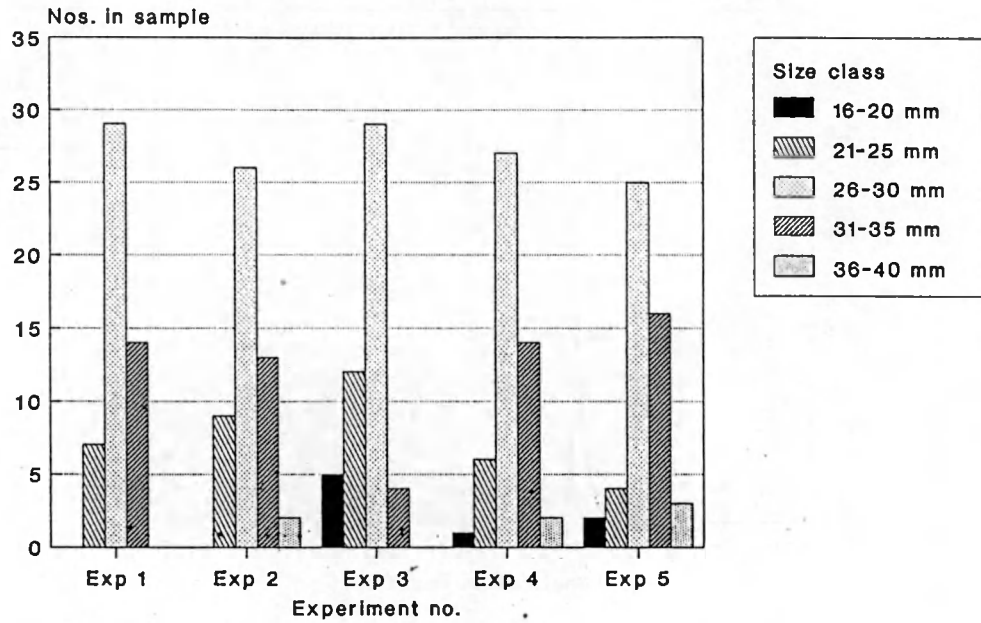


Figure 5.3.1. (A)

Nephrops : Discard survival experiments
Size distributions of samples
Experiments 6-10

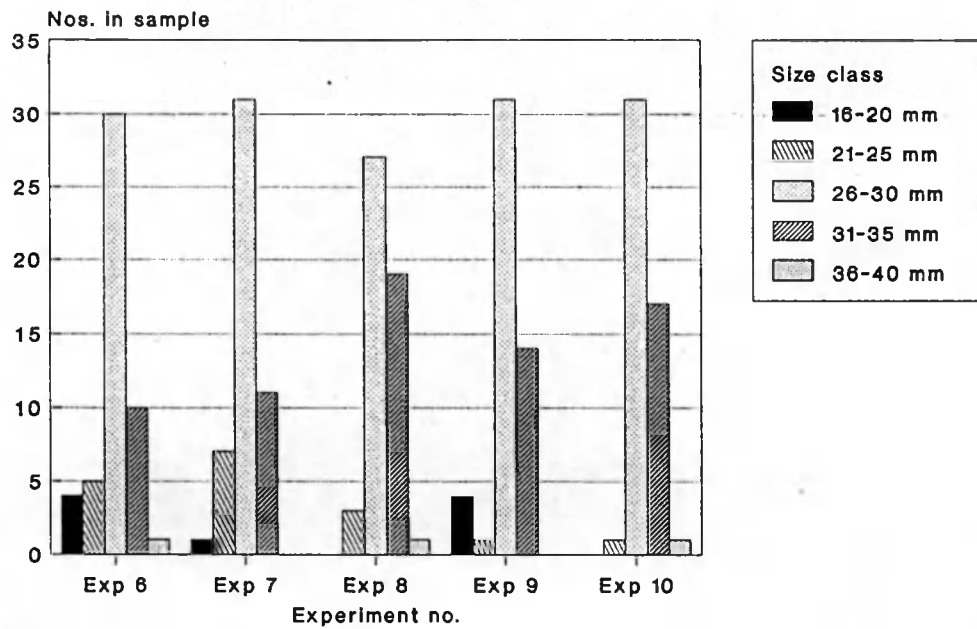


Figure 5.3.1. (B)

Nephrops : Discard survival experlments
Size distribution of samples
All experlments combined

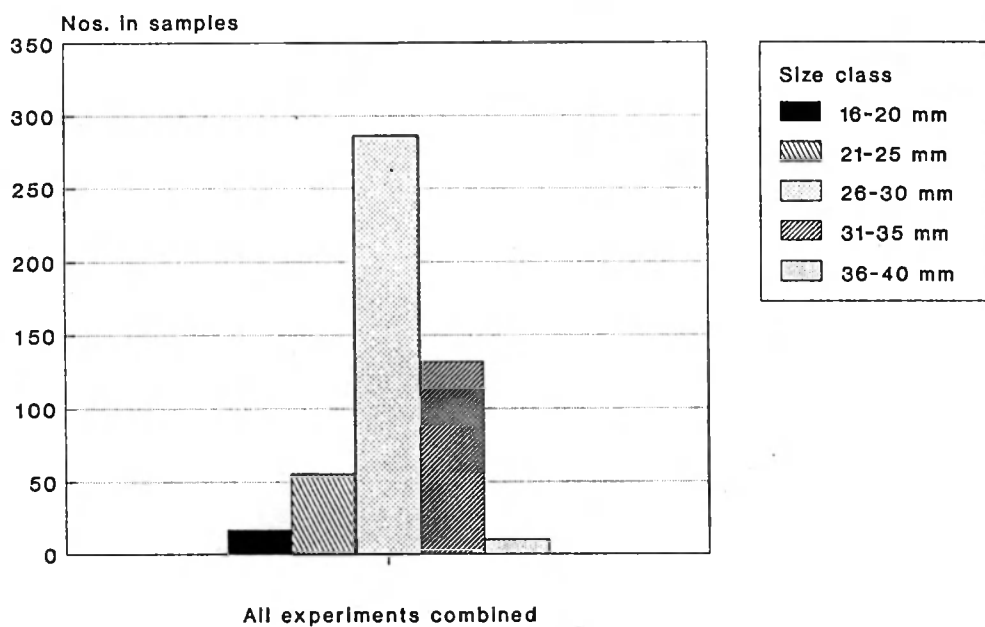


Figure 5.3.2.

Nephrops : Discard survival experiments
 Percentual distribution of observations
 All experiments/size classes combined

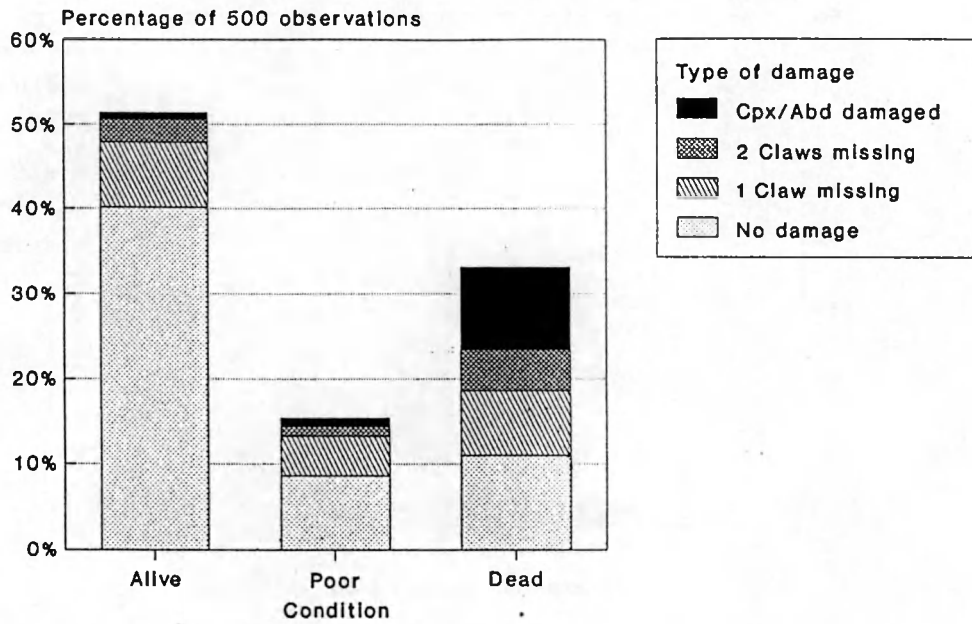


Figure 5.3.3.

Nephrops : Discard survival experiments
 Effect of 'damage type' on survival
 All experiments/size classes combined

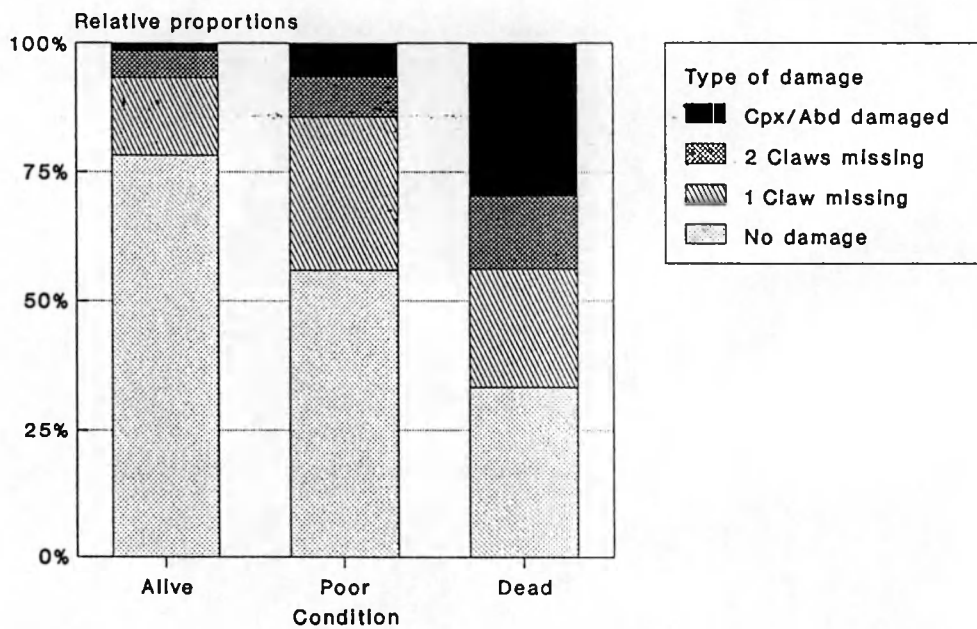


Figure 5.3.4.

