

THE 1991/92 FISHERY FOR *DISSOSTICHUS ELEGINOIDES* IN SUBAREA 48.3

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Abstract

The 1991/92 longline fishery for *Dissostichus eleginoides* in Subarea 48.3 was open from 4 November 1991 to 10 March 1992. A total of 3 382 tonnes was taken by one Bulgarian, five Russian and eight Chilean vessels. The maximum catch taken in a five-day period was 375 tonnes. Catch rate was not influenced by fishing depth, time of day or soak time, but was dependent on type of hook and geographical position. Fish caught around Shag Rocks were larger than to the north and southeast of South Georgia. CPUE varied markedly among fleets and was about 1 kg/hook in the Chilean fleet, 0.2 to 0.4 in the Russian and 0.2 in the Bulgarian. These differences were probably a result of the different hook types used by the fleets.

Résumé

En 1991/92, la pêche à la palangre de *Dissostichus eleginoides* dans la sous-zone 48.3 était ouverte du 4 novembre 1991 au 10 mars 1992. Au total, 3 382 tonnes ont été capturées par un navire bulgare, cinq navires russes et huit navires chiliens. La capture maximale était de 375 tonnes pour une période de cinq jours. Le taux de capture n'était pas influencé par la profondeur de pêche, l'heure ou le temps de trempage; par contre, il était fonction du type d'hameçon et de la position géographique. Les poissons capturés étaient plus grands autour des îlots Shag qu'au nord et au sud-est de la Géorgie du Sud. La CPUE variait nettement entre les flottes: 1 kg/hameçon dans la flotte chilienne; de 0,2 à 0,4 dans la flotte russe; 0,2 dans la flotte bulgare. Les différents types d'hameçons utilisés expliquent vraisemblablement ces différences.

Резюме

В Подрайоне 48.3 ярусный промысел *Dissostichus eleginoides* был открыт с 4 ноября 1991 г. по 10 марта 1992 г. Всего было получено 3 382 тонны одним болгарским, пятью российскими и восьмью чилийскими судами. Максимальный вылов - 375 тонн за один пятидневный период. На интенсивность лова не влияли глубина лова, время суток или время нахождения яруса в воде, однако интенсивность лова зависела от типа крючка и географического местоположения лова. Более крупные особи вылавливались вокруг скал Шаг, чем в районах к северу и юго-востоку от Южной Георгии. СРUE в значительной мере колебался между промысловыми

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флотами: 1 кг/крючок у чилийского флота; 0,2-0,4 у российского флота и 0,2 у болгарского флота. Эти различия вероятно являлись следствием использования флотами крючков различных типов.

Resumen

La temporada de pesca de palangre de 1991/92 de *Dissostichus eleginoides* en la Subárea 48.3 estuvo abierta del 4 de noviembre de 1991 hasta el 10 de marzo de 1992. Un total de 3 382 toneladas fueron extraídas por un buque pesquero búlgaro, cinco rusos y ocho chilenos, dándose un máximo de captura de 375 toneladas en un período de cinco días. El nivel de captura no se vio influenciado por la profundidad de pesca, hora del día o tiempo de calado, pero sí dependió del tipo de anzuelo y de la situación geográfica. Se pescaron peces más grandes alrededor de las rocas Cormorán que al norte y sudeste de Georgia del Sur. El CPUE varió significativamente entre las flotas, siendo de 1 kg/anzuelo para la flota chilena, 0.2 a 0.4 para la flota rusa y 0.2 para la flota búlgara. Es posible que esto haya ocurrido debido a los distintos tipos de anzuelos utilizados por las flotas.

1. INTRODUCTION

The 1991/92 fishery for *Dissostichus eleginoides* opened on 4 November 1992 with a TAC of 3 500 tonnes, and was closed on 10 March 1992 when a total of 3 364 tonnes had been taken. A further 18 tonnes was taken by Bulgaria before it ceased fishing on 24 March. The maximum catch taken in a five-day period was 375 tonnes (Figure 1).

The fishery was prosecuted by one Bulgarian, five Russian and eight Chilean vessels, fishing for different periods (see Figure 2). Vessel size was reported as 500 to 1 000 tonnes for Bulgaria and Russia, and as shown in Table 1 for Chile.

1.1 Data Sources

Catch and effort data were reported by five-day periods and in fine-scale longline format. These data were used in the following analysis. In addition, length frequency data were reported by Chile and Russia in standard format. Chilean data were extracted from logbooks and included the weight, but not the number, of fish caught, thus precluding some calculations in the following analysis.

1.2 Fishing Strategies

Two clear fishing strategies were identified in the Russian fishery. Some vessels set all their lines (usually three to four) in the early morning, and then commenced hauling; others set and hauled lines alternately to maintain a standard soak time for the lines. This led to very different times in the water for the first group of vessels, but more consistent times for the second. These strategies are shown schematically in Figure 3.

There was no significant correlation between the time that hooks were in the water and the number of fish caught or CPUE (both in numbers and weight) for either the Bulgarian or Russian fishery. Thus, it appears that the strategies shown in Figure 3 have no bearing on

expected catch rates and are significant only for logistic reasons. However, there was a positive relationship between mean number of fish caught per haul and the number of hooks on the line for the Russian fishery over the whole season (Figure 4).

The number of hooks per line, and the size of hooks varied considerably among vessels (Tables 1 and 2). In the Chilean fleet six different hook sizes of four general types were used:

- Type I - hooks with parallel sides and in a single plane ("parallel, flat") [Mustad sizes 3 and 5; width 20 to 25 mm (Moreno, 1991)];
- Type II - hooks slightly recurving at the barb and twisting out of a single plane ("semicurved, twisted") [Japanese brand, sizes 7 and 9; width 30 to 35 mm];
- Type III - hooks fully recurving, in one plane ("curved, flat") [Mustad size 14; width 27 mm (Moreno, 1991)]
- Type IV - hooks parallel, twisting and without an eye (all the above are eyed) ("parallel, eyeless") [Japanese hooks size 22; width 28 mm].

On some vessels more than one type of hook was used, even on the same longline. This strategy was attributed to vessels moving to the *Dissostichus* fishery having recently targeted other species, such as pink ling (*Genypterus blacodes*) and hake (*Merluccius australis*) in Chilean fisheries, and to trying to determine the most effective hook for *D. eleginoides* (SC-CAMLR, 1992b). With the exception of vessel (e) (Table 2), the hooks used in the Russian fishery were probably of type I.

A number of different baits were used in all fisheries: squid (*Loligo, Ilex*), *Sardinops*, Mackerel and Horse Mackerel (including *Scomber*). By-catch mainly comprised skates and macrourids, reported occasionally by Russian and Bulgarian fleets. Two reports from early December by the Russian fleet indicated some incidental mortality of unidentified birds but subsequent reports indicated zero mortality.

The position of all catches is shown in Figure 5 (a to c). The Chilean fleet showed most movement between areas, with the Russian and Bulgarian fleets remaining to the north and close north-west of South Georgia. The depth of fishing for the Russian, Bulgarian and Chilean fisheries was similar, with means of 1 334 m, 1 378 m and 1 473 m respectively and distributions typically ranging from 1 000 to 1 800 m with strong modes between 1 300 and 1 400 m.

Hook size was reported for only some of the length frequencies recorded by Chilean vessels. From these data it appears that within a type of hook, larger hooks catch larger fish; however, hooks of type I caught larger fish than the larger type II hooks, and the curved hooks of type III caught markedly larger fish than any others (Figure 6).

Combining all data from the Chilean fishing season it is possible to identify three major areas of fishing, defined as northwest of South Georgia ("Shag Rocks"), north of South Georgia and southeast of South Georgia, each with a characteristic length frequency distribution (Figure 7). The mean weight of fish from the Russian fishery in the northwest area (west of 41°W) was 9.78 kg (n = 153 hauls, SD = 2.09), while from the northern sector it was 8.86 kg (n = 347, SD 2.48), significantly lower than in the Shag Rocks area (t test, p<0.001). This result is similar to that seen in Figure 7, where there is an increasing proportion of larger fish in the northwest area. Mean weights from the Bulgarian fishery showed similar, but insignificant, differences between regions (7.11 kg northwest, 6.95 kg north). However, the length frequency

data reported from the Russian fishery (Figure 8) appear to show a contrary trend, where there is an increasing proportion of larger fish in the north than the northwest areas¹.

Mean weight of fish in the Russian and Bulgarian fisheries did not change over the period of the commercial fishery, but did appear to increase during the Russian research fishery from April to June (Table 4). However, some vessels caught significantly smaller fish than others, especially vessel (a) which seemed to improve its performance later in the year.

CPUE

Daily CPUE, expressed as kg/thousand hooks for comparative purposes between fleets, is shown in Figure 9 (a to c). The CPUE for Chilean vessels was far in excess of that for Russian and Bulgarian vessels, with the former having a mean CPUE in February of about 1 000 compared to between 200 and 400 for Russian vessels and about 200 for Bulgarian vessels.

Whilst the CPUE for Chilean vessels showed a decline throughout the season, Bulgarian and Russian vessels did not experience this; on the contrary, it appears from Figure 9 that the Russian CPUE increased in late February and March. A more detailed analysis of the Russian and Bulgarian CPUE (numbers/thousand hooks) (Table 3) shows the increase in overall CPUE in March to be a result of vessel (e) entering the Russian fishery. Although the catches were in similar positions and at similar depths to catches by other vessels, vessel (e) used larger hooks and shorter lines than other vessels (Table 2). It thus appears that gear differences may have been the cause of the higher CPUE values for vessel (e), seen both in Table 3 and Figure 4.

DISCUSSION

The 1991/92 fishing season for *D. eleginoides* was rather shorter than previous seasons, primarily because of the entry into the fishery of the large Chilean fleet with its very high CPUE.

There were large differences in CPUE among and within fleets. All fleets were operating in similar areas (apart from the extra area southeast of South Georgia exploited by the Chilean fleet), at similar depths over similar times, but the line characteristics of the fleets were different. Chilean vessels used longer lines, larger hooks and a different types of hook from the other vessels. It is perhaps significant that the one Russian vessel to use a larger hook achieved a much increased CPUE over February to March. The UK reports of an attempted inspection of a Russian longliner and an inspection of the Chilean *Mar del sur III* (SC-CAMLR, 1992a and 1992b) found that the Russian longlines retained less bait and caught fewer fish than the Chilean vessels. It appears that the differences in CPUE between these two fleets may have been due to the different types and sizes of hooks used, but there is probably also a large component of fishing skipper experience in the choice of appropriate sites for setting the longlines, even within the generalised areas shown in Figure 5.

Both Russian and Chilean fleets caught larger fish in the west of the Subarea 48.3, towards Shag Rocks, than in the east. However, the average weight of fish caught by the Russian fishery was lower than the mean weight assumed for this species by the Working Group on Fish Stock Assessment (WG-FSA) in 1991 (9.14 kg compared to 10.82). Chilean and Russian CPUE have been superimposed on the data extracted from STATLANT reports by WG-FSA in 1991 (assuming 10.82 kg/fish). The Russian data appear to show a decline in CPUE for this species; however, there may be some effect of interaction among the fleets since up to now this has been a single fleet fishery. These data, supplied in haul-by-haul formats, have proved extremely useful in understanding the mechanics of the *D. eleginoides* fishery.

¹ Reported total lengths from the Russian fishery were converted to standard length for comparison with the Chilean data using the relationship $TL=1.247+1.118SL$ given in Kock *et al.*, (1985).

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Table 1: Chilean fleet characteristics, 1991/92 season.

| Vessel Name | Length (m) | GRT (tonnes) | Hold Capacity (m ³) | Hook Sizes |
|------------------------|------------|--------------|---------------------------------|------------------|
| <i>Mar del Sur I</i> | 46 | 349.5 | 380.7 | Mixed (see text) |
| <i>Mar del Sur III</i> | 48.8 | 299.4 | 290 | “ “ “ |
| <i>Chaval</i> | 42.5 | 325 | 350 | “ “ “ |
| <i>Antonio Lorenzo</i> | 50 | 650 | 500 | “ “ “ |
| <i>Isla Sofia</i> | 48.5 | 449 | 505 | “ “ “ |
| <i>Cisne Verde</i> | 44.4 | 327.1 | 562 | “ “ “ |
| <i>Cisne Blanco</i> | 46.7 | 437 | 457 | “ “ “ |
| <i>Friosur V</i> | 54 | 975 | 746 | Japanese No. 22 |
| | 47.6 | 466.5 | 473.8 | |

Table 2: Line characteristics of Russian and Bulgarian vessels.

| Vessel | Hook Size | Hook Spacing | Number of Hooks |
|----------------------------|-------------|--------------|-----------------|
| Russian a | 20 to 25 mm | 120 cm | 2800 - 5600 |
| Russian b | 20 to 25 mm | 120 cm | 2400 - 4800 |
| Russian c | 20 to 25 mm | 120 cm | 2400 - 4800 |
| Russian d | 20 to 25 mm | 120 cm | 13500 |
| Russian e | 25 to 30 mm | 120 cm | 3200 |
| Bulgarian | 25 to 30 mm | 120 cm | 1125 - 9000 |
| Chilean (vessel undefined) | 25 to 30 mm | 200 cm | 11700 |

Table 3: CPUE and calculated mean fish weight by month.

Russia:

| Month | Vessel | Mean CPUE number x 10 ³ hooks | SD | Mean Wt (kg) | SD | n |
|-------|--------|--|--------|-----------------|-------|-----|
| 12 | a | 29.6 | (23.8) | 6.70 | (1.6) | 50 |
| 12 | b | 29.0 | (9.4) | 10.03 | (1.0) | 30 |
| 12 | c | 29.2 | (14.3) | 9.02 | (1.2) | 25 |
| | Total | 29.3 | (18.4) | | | 105 |
| 1 | a | 32.9 | (14.7) | 5.44 | (0.6) | 30 |
| 1 | b | 28.7 | (14.1) | 10.87 | (2.0) | 30 |
| 1 | c | 33.8 | (16.8) | 9.27 | (1.4) | 70 |
| | Total | 32.4 | (15.8) | | | 130 |
| 2 | a | 25.9 | (11.0) | 5.52 | (0.9) | 42 |
| 2 | c | 43.8 | (16.1) | 9.93 | (0.7) | 21 |
| 2 | d | 20.0 | (6.3) | 9.02 | (0.1) | 7 |
| 2 | e | 47.6 | (19.1) | 9.38 | (0.2) | 23 |
| | Total | 34.9 | (17.7) | | | 93 |
| 3 | a | 34.4 | (13.2) | 8.05 | (2.4) | 10 |
| 3 | c | 38.7 | (17.3) | 10.87 | (1.5) | 29 |
| 3 | d | 14.9 | (3.5) | 9.00 | (0.0) | 9 |
| 3 | e | 74.7 | (17.9) | 9.71 | (0.1) | 34 |
| | Total | 50.5 | (26.9) | | | 82 |
| 4 | a | 40.4 | (13.8) | 11.67 | (1.4) | 8 |
| | Total | 40.4 | (13.8) | | | 8 |
| 5 | a | 17.0 | (9.2) | 9.89 | (1.8) | 7 |
| 5 | b | 28.3 | (12.7) | 10.53 | (1.1) | 10 |
| | Total | 23.6 | (12.5) | | | 17 |
| 6 | a | 20.3 | (10.2) | 12.62 | (0.9) | 36 |
| 6 | b | 40.8 | (16.8) | 11.12 | (1.5) | 29 |
| | Total | 29.4 | (17.0) | | | 65 |
| Total | Total | | | 9.14 | (2.4) | 500 |

Bulgaria:

| Month | Vessel | Mean CPUE number x 10 ³ hooks | SD | Mean Wt (kg) | SD | n |
|-------|--------|--|--------|-----------------|-------|-----|
| 12 | 1 | 23.6 | (20.9) | 7.66 | (1.4) | 67 |
| 1 | 1 | 19.8 | (12.3) | 6.86 | (1.3) | 56 |
| 2 | 1 | 32.9 | (13.1) | 7.11 | (1.0) | 36 |
| 3 | 1 | 30.0 | (16.5) | 6.29 | (1.1) | 45 |
| Total | | | | 7.04 | (1.4) | 204 |

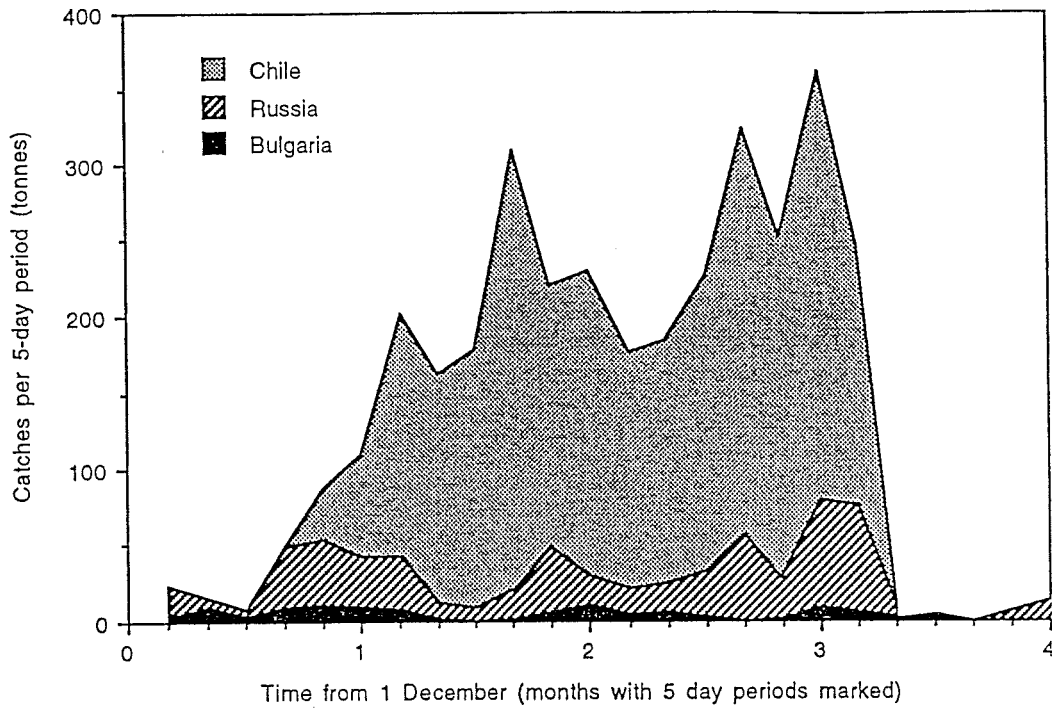


Figure 1: *D. eleginoides* fishery, 1992 season. Catches by five-day period.

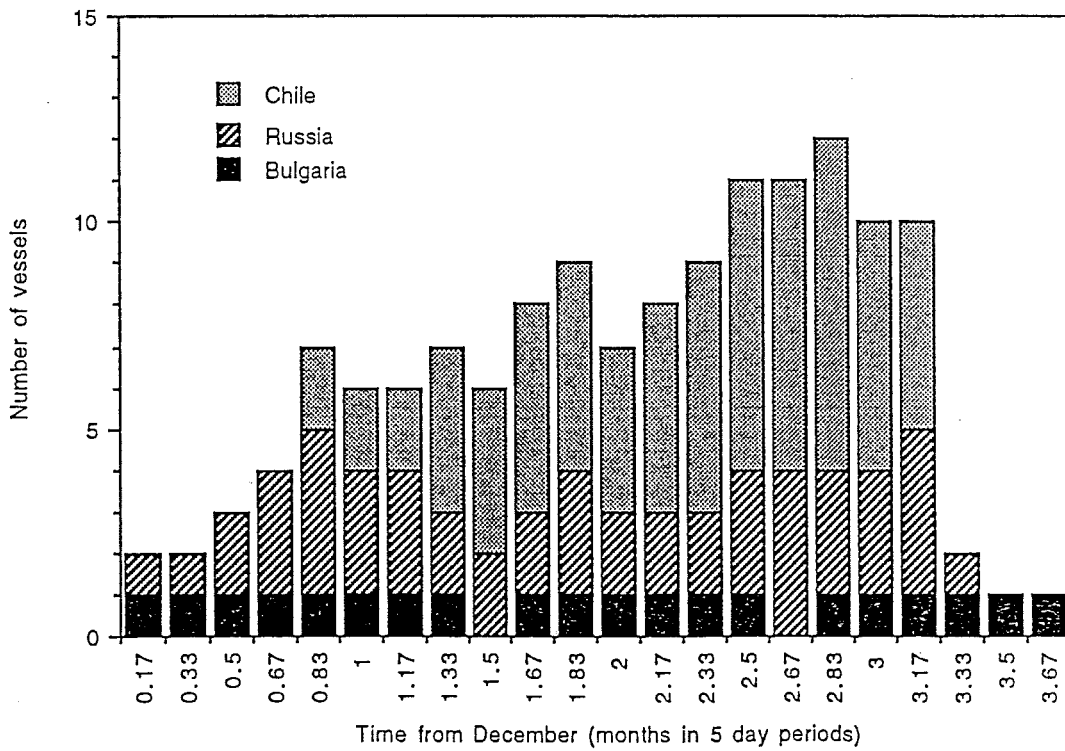


Figure 2: Number of vessels taking part in the fishery.

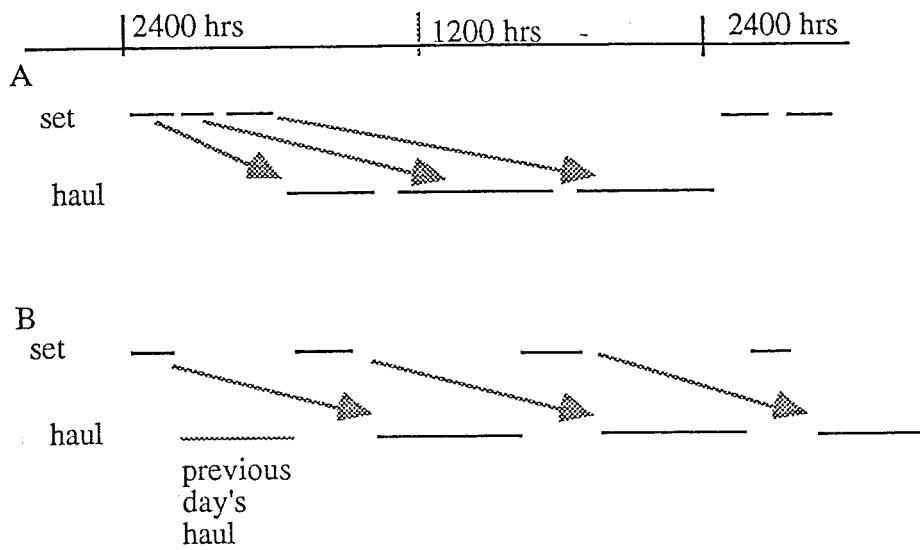


Figure 3: Schematic diagram of fishing strategies shown by the Russian and Bulgarian fleets.

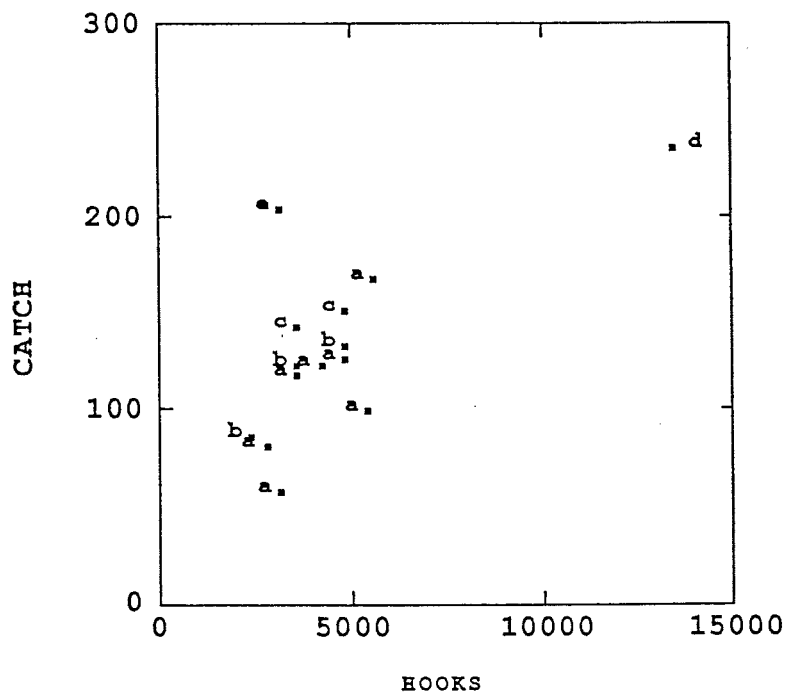
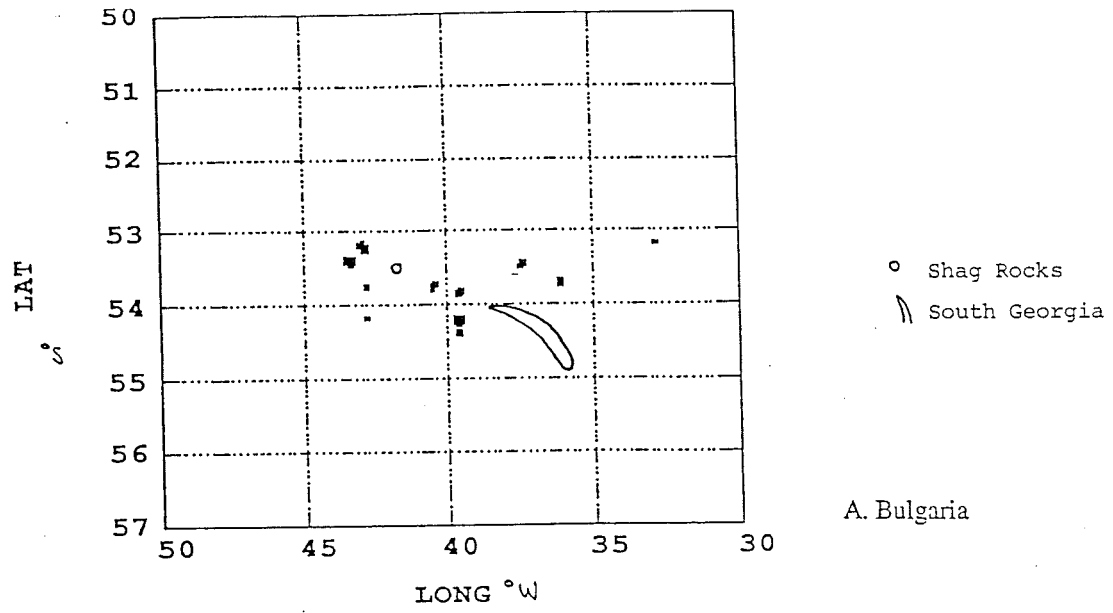
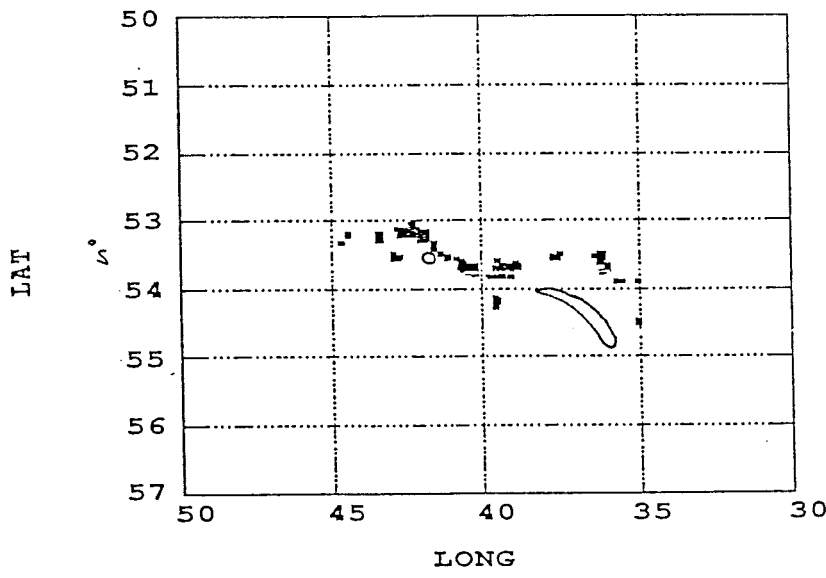


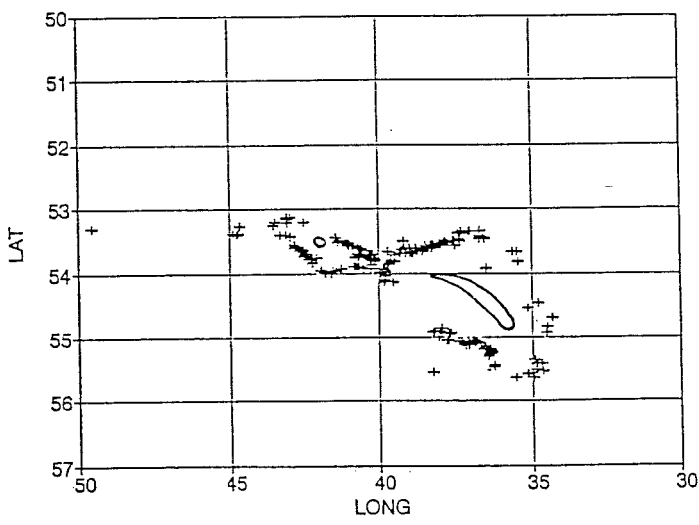
Figure 4: Relationship between catch (numbers of fish per haul, as mean over whole season) and effort (numbers of hooks per haul) for Russian vessels a - e (see Table 2).



A. Bulgaria



B. Russia



C. Chile

Figure 5: Position of all hauls in Subarea 48.3, 1992 season.

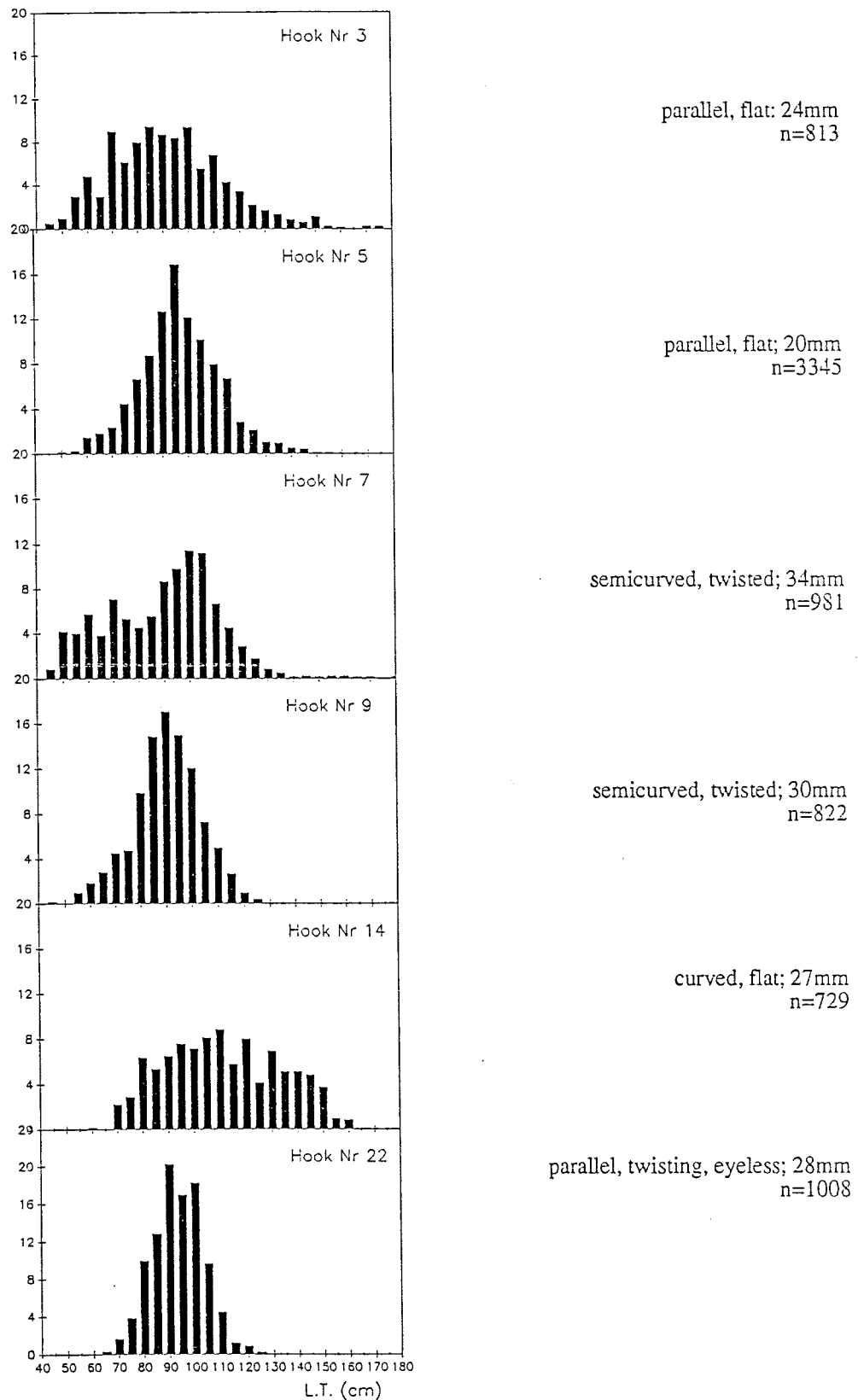


Figure 6: Normalised length frequencies of *D. eleginoides* caught by Chilean vessels (total length converted from standard length using the relationship given in Kock *et al.* (1985)).

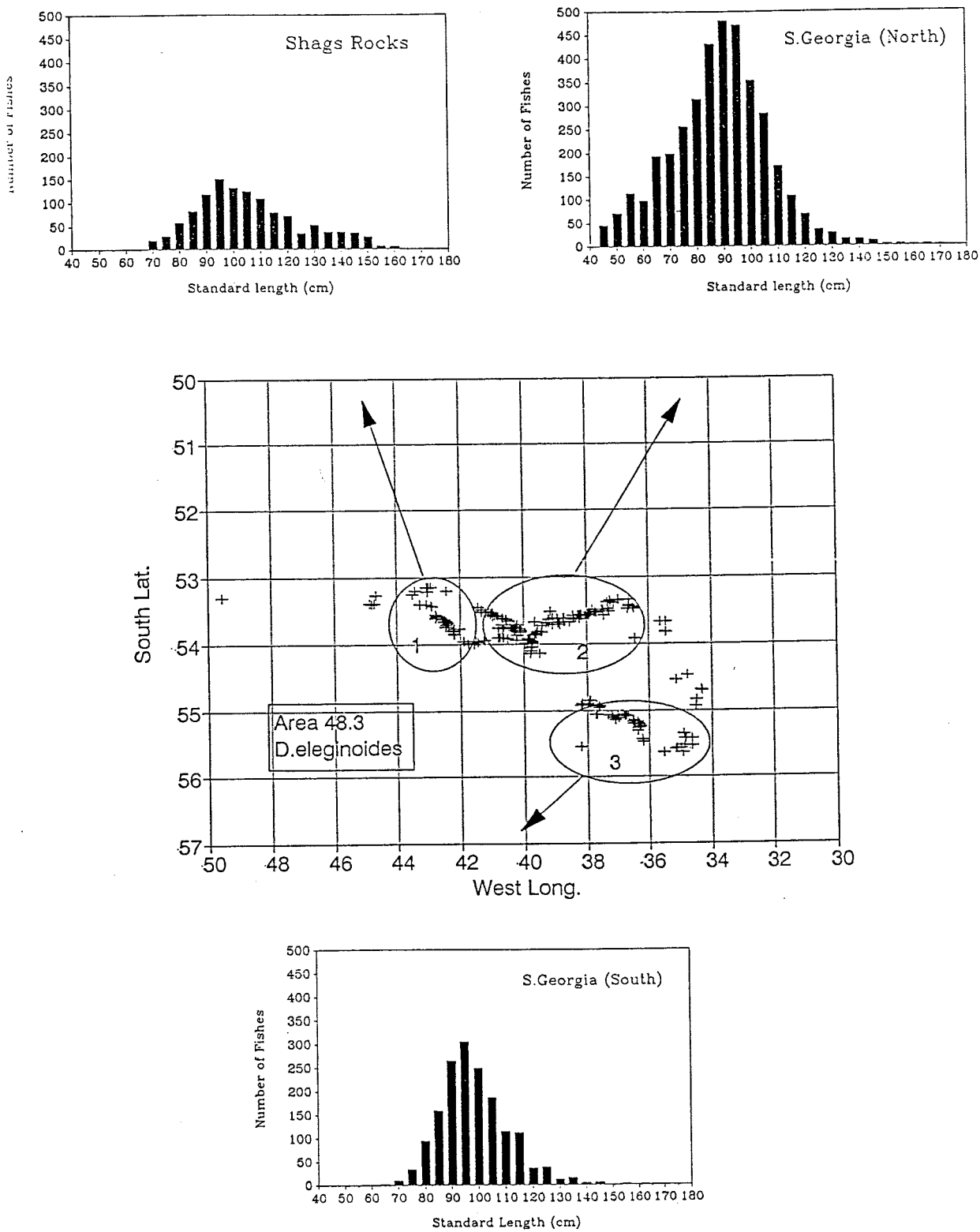


Figure 7: Length composition of *D. eleginoides* taken by Chilean vessels (reported by haul).

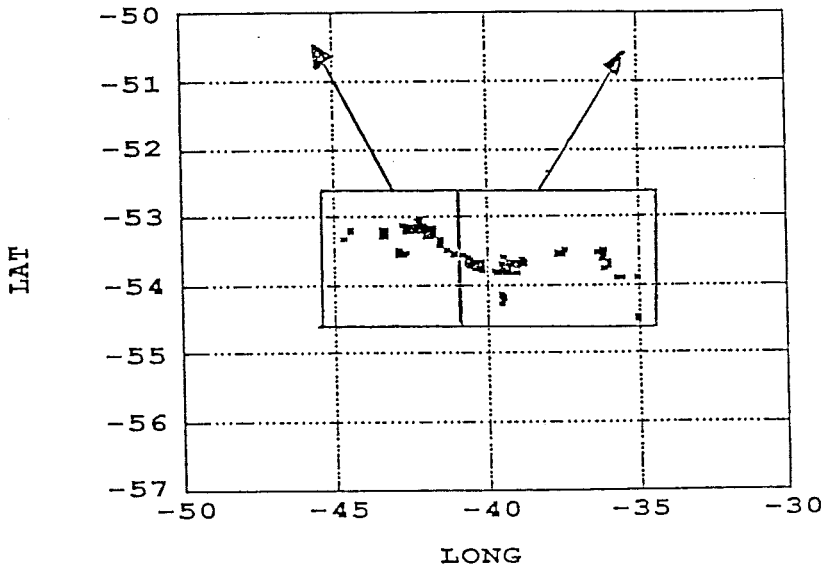
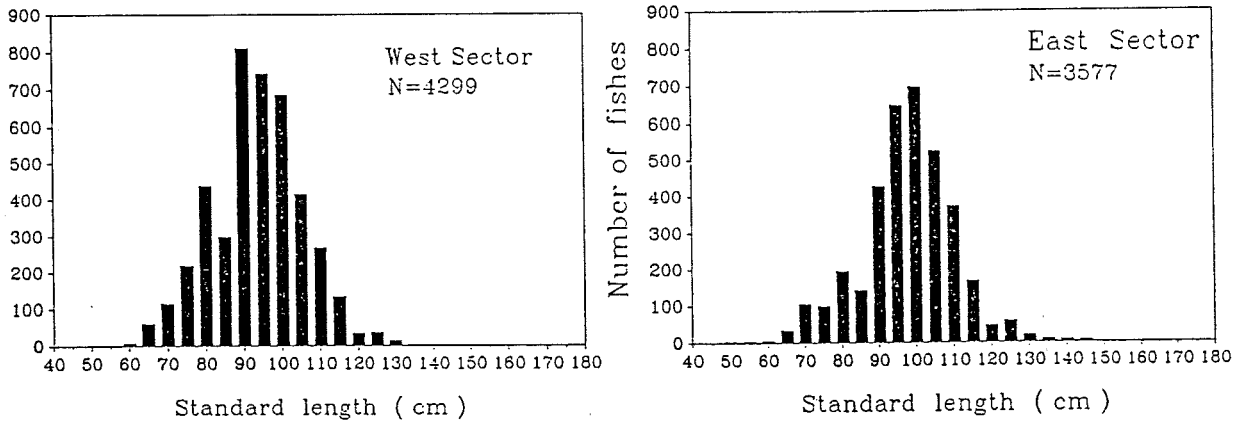


Figure 8: Length composition of *D. eleginoides* taken by Russian vessels (reported by summary catches).

Fig. 9a: Chilean fleet

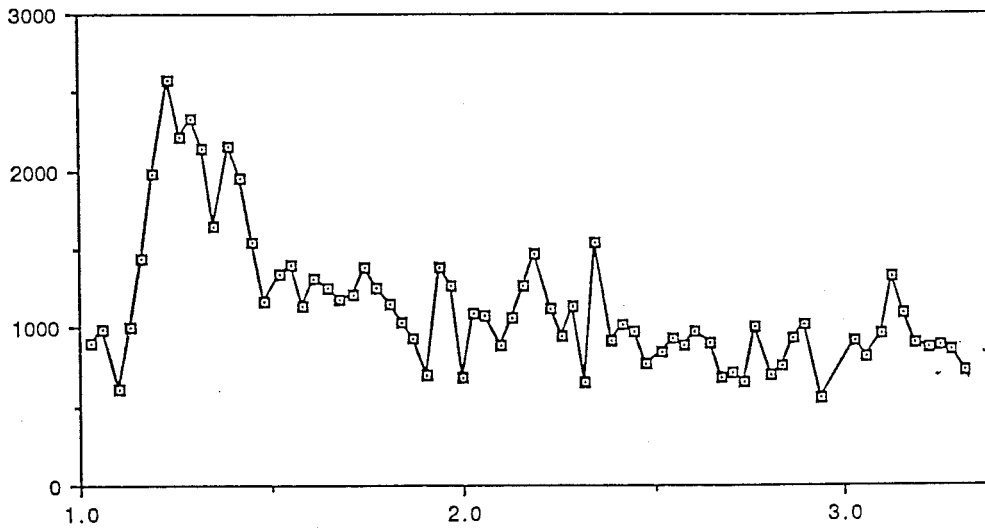


Fig 9b: Russian fleet

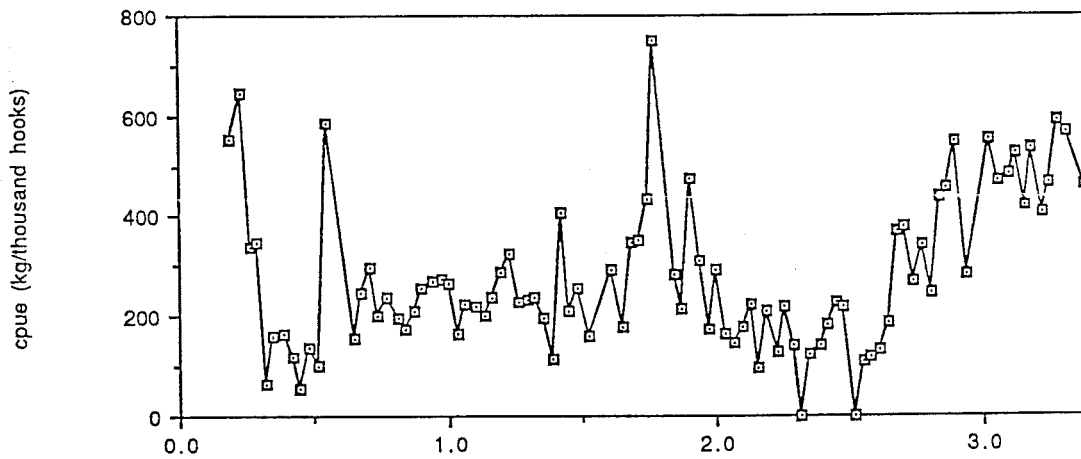


Fig. 9c: Bulgarian fleet

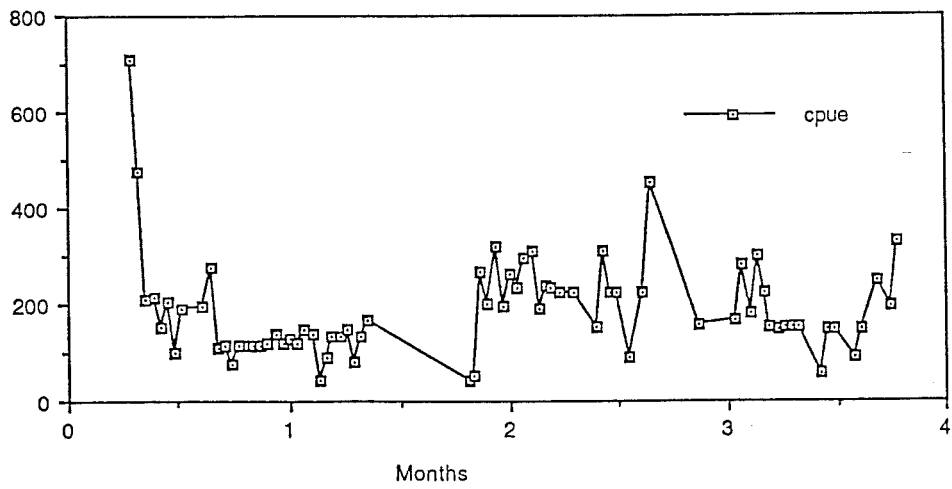


Figure 9: CPUE (weight) in Chilean, Russian and Bulgarian fleets, 1992.

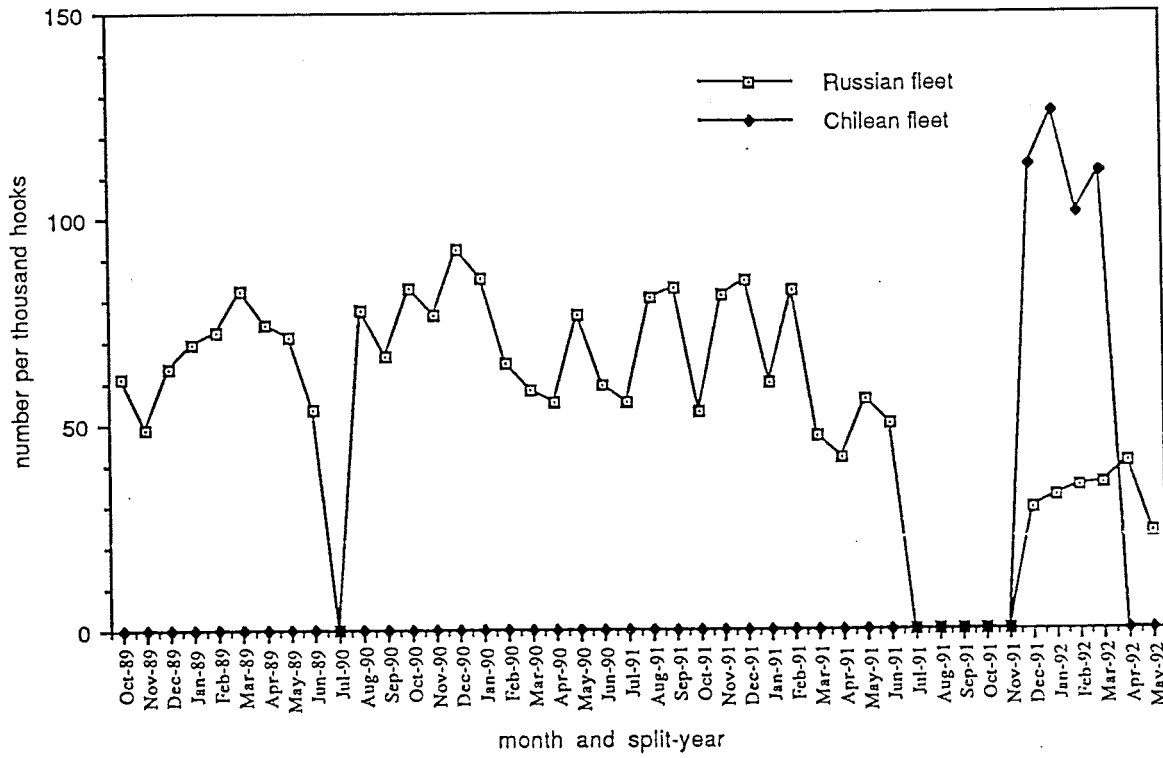


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- Figura 6: Distribución normalizada de frecuencia de tallas para *D. eleginoides* capturado por las embarcaciones chilenas (la longitud total fue transformada utilizando la longitud estándar obtenida de las relaciones presentadas en Kock *et al*. (1985)).
- Figura 7: Composición por tallas de *D. eleginoides* de la captura chilena (notificadas por lance).

- Figura 8: Composición por tallas de *D. eleginoides* de la captura rusa (notificadas en el resumen de las capturas).
- Figura 9: CPUE (peso) de las flotas chilena, rusa y búlgara, 1992.
- Figura 10: CPUE para la última temporada superpuesta sobre los datos presentados en el informe de 1992 del WG-FSA (SC-CAMLR-X, anexo 6).